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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

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VOL. XL., No. 5. FRIDAY, FEBRUARY 2, 1906.

The Government Accident Bulletin, which is reprinted in this issue, gives the cause of the disastrous butting collision of August 13 (Vermillion, Ohio), in clear terms. As in so many cases in the past, two or three men were in position to check the engineman's recklessness if they had acted promptly. The account of the drawbridge disaster at Bruce, Va., in the same month, confirms the statements, printed at the time, of the astounding way in which an engineman unacquainted with the road was entrusted with a heavily loaded passenger train. Collision No. 16 illustrates a combination of two operators, both young and both lacking in experience, with a "control" apparatus for block signals, which, it appears, did not control. Why should boys of 19 be entrusted with delicate duties at three o'clock in the morning? A wise old superintendent said once, in this connection, that "growing boys" should be expected to sleep in the night, not keep awake. The value of a detector bar, which is so short that it does not always detect, is illustrated in two accidents in this bulletin.

The railroads running from the Missouri river westward are told by the Interstate Commerce Commission that they ought to carry cotton piece goods to Denver at a rate much less than that for ordinary dry goods, simply because most of the roads in the United States east of the Missouri have long made such a reduction. Is not that a highly scientific reason? Another part of the decision against the Boston & Albany and its connections (printed in our news columns) is based on the dictum that the freight rate from Boston to Chicago is a "local rate," which will hardly be acceptable to railroad theorists. When the Commission decides that the rate to Denver (2,000 miles) should be reduced from $2.24 to $1.50 because the railroads accept $1.50 for 3,400 miles, it has a more plausible argument, for freight cannot be carried 1,400 miles for nothing. But even this is based on an assumption—the assumption that the $1.50 rate to San Francisco is not below cost. And this assumption is based on the belief that a wise railroad man would not carry for less than cost. There might, however, be good reasons for this, if the volume of traffic were not large. But suppose $1.50 does cover the bare cost of handling (without paying anything toward bond interest, or dividends, or loss on passenger business); and that on the same basis the rate to Denver should be ten-seventeenths of $1.50, or 88 cents; does it follow that $2.24 is too high to Denver? Not necessarily, for it may well be that the Denver traffic ought to pay its full share of interest and profit. In short, it seems to us that the best reason to give in a formal decision for reducing the difference between the Denver rate and the lower rate to San Francisco, is that the Denver merchants will make an intolerable row if their demands are not met—will make life miserable for both the Government authorities and the railroad officers, which is, no doubt, the real reason.

The salient fact about the progress in block signaling which has been made in the United States within the last year, as shown in the table published in the *Railroad Gazette* to-day, is that about 50 per cent. more automatic block signals have been installed than were installed in the year preceding. The increase in 1905 over 1904 is 1,082.6 miles of road signaled; in 1904 over 1903 it was 725 miles. And the increase the year before that was only 500 miles. The increase shown in the total mileage, manual and automatic combined, is not much larger than it was a year ago; but this figure has a different significance, because a considerable mileage of the new automatic signaling takes the place of manual signals. That is to say, a good deal of money has thus been spent in making shorter blocks, providing more safeguards and introducing a more complete equipment of distant signals, which has not made any increase in the aggregate mileage of road signaled. The roads appearing in the table this year for the first time are the Hocking Valley, the Louisville & Nashville, the Oregon Railroad & Navigation Company, the Seaboard Air Line and the Yazoo & Mississippi Valley. The amount of new work proposed for the present year, 2,599 miles, is much smaller than the amount proposed a year ago; but there are probably fewer items which represent good intentions and nothing more. Certain prominent lines which gave us their estimates for 1905, withhold all information on the subject for 1906; but there is no doubt that they will put up many new signals. The Southern Pacific and its allied lines make a remarkable showing. In 1905 they extended their block signaling 470 miles, and this year they intend to do almost 50 per cent. more than that. Some railroads east of the Mississippi, which defer the introduction

of block signals on some of their lines because the business is not thought to be heavy enough, might possibly take a lesson from the wilds of Wyoming and Idaho.

A stationman or a trainman, in giving information to a passenger, should do it in such a way as not to discourage questioning. This is only reasonable treatment of a reasonable passenger, and the duty is so obvious that when the railroad commissioners of Massachusetts, in their annual report, lay it down as a law, one is somewhat surprised and almost inclined to query whether such a commonplace remark deserves a place in a dignified public document. Unfortunately, a very little experience in traveling will usually show to any one the necessity of the Massachusetts admonition; and the need is not confined to the South station, or to Boston, or to any state, or to the year 1905. The few passengers who deserve to be kicked out of the station seem to greatly exasperate the tired ticket agent, and the multitudes who ask one or two foolish questions each are constantly helping to confirm the agent's unpleasant feeling; the acquirement of information concerning delayed trains is a difficult and unpleasant task for even the wisest passenger, and the stationman frequently has to give answers which are inevitably received with disappointment or anger; and so the average railroad employee goes on building up for himself a bad reputation. Yet it will be comparatively easy for any superintendent to change the tone of the talk in any or all of his stations if he will only issue a very simple order in line with the Massachusetts recommendation. The first element in such an order is to make it clear that the superintendent himself really desires to give the public prompt information concerning delayed trains, and the second will be to convince the employees that those who are politest and most patient will receive recognition. Those two points cover the ground. A premium for excellence in this line certainly ought to be as profitable to the company as one to a track supervisor whose skill in sandpapering the ends of ties is one-tenth of one per cent. above the average of his fellow-trackmen's records. The only way the superintendent can make agents believe in his good intentions is to carry them out. When a despatcher notifies the superintendent that a certain train is going to be an hour late, why wait half an hour before giving the same information to intending passengers? Or why tell the passenger 40 minutes when the delay is more likely to be 80? If information for the public must all go through the strainer at headquarters, the person who adjusts the meshes of the strainer should be always on duty. Employees are required to be courteous at all times; but here is a piece of machinery which is often essential to the company's courtesy, but which is very likely to be rusty from lack of care. The advice to freight agents by Mr. W. C. Hungerford, which was given in the *Railroad Gazette* of January 26, page 92, is good also for ticket agents, telegraph operators, brakemen and all who deal with the public. It is good to put on your smile when you put on your clothes. And with the telegraph and telephone in use everywhere, the company's part of the smile—prompt and full information—is easily practicable at all times. The telautograph, by which a yardmaster or signal-tower clerk in a large terminal yard gives train announcements in advance to a dozen places in and around the station simultaneously, and without the aid of a receiving operator, embodies a principle which ought to be put in use in multitudes of places. When a reputable newspaper says—as the *New York Times* said recently in connection with a snowstorm delay in New Mexico—that all railroads have, and act on, "an instinctive hatred for explaining their own mishaps and shortcomings," and that there is no sign of improvement, it convicts the railroads generally; for its statement is sincerely indorsed by a jury of the public on which sit many respectable and conservative people.

THE EFFECT OF SEA WATER ON CONCRETE.

Much more attention and investigation has been given in Europe to the matter of the action of sea water upon concrete than in this country. It is, of course, generally known that where Portland cement concrete is exposed to sea water, chemical action between the acids contained in the water and the lime of the cement ensues; and if the composition of the concrete be such that the sea water can penetrate the mass, the concrete will be disintegrated and the masonary ultimately destroyed. Mr. R. Feret, Chief of the Laboratory of Bridges and Roads, Boulogne-sur-Mer, France, an acknowledged authority on the subject, has recently said that no sure means of preventing such failures has been found. And although it has been pointed out that a great many existing marine works which have been standing for a long time demonstrate that Portland cement mortar may be thoroughly durable in sea water, Mr. Feret says that it is not at present known why they have resisted so well, as there is little doubt that the cements from which they were made might have decomposed rapidly if they had been used under different conditions; there are many cases where similar structures have been ruined in a few years. The tests in La Rochelle harbor, France, showed the wisdom of awaiting the lapse of sufficient time before coming to conclusions regarding the durability of marine concrete structures. These tests covered a period of about 40 years, and by the end of that time they served to demonstrate conclusively that if the sea water penetrates the mass the hydraulic binding media cannot resist its action.

In a contributed chapter to Taylor and Thompson's treatise on concrete, Mr. Feret says the real cause of the decomposition has been found to be sulphuric acid combined as a soluble sulphate, the final product in the concrete being a sulpho-aluminate of lime, which causes the disintegration; therefore, cements rich in lime are the most quickly decomposed. Moreover, for cements intended for marine use the aluminum should be kept as low as possible. The Administration of Public Works in France limits the amount for such uses to 8 per cent.

Experiments disclosed a distinct difference in the method of decomposition, depending on whether the sea water in which the concrete is immersed remains perfectly quiet, or conditions enable a continuous filtration to occur. In the latter case the mortars or concretes from coarse sand remained intact during the life of the experiment, while the degree of activity of the decomposition increased correspondingly as the amount of fine sand was increased. It is of considerable interest to know that instances of destruction of concrete or mortar by sea water have in most cases been proven to be due to the use of too fine sands, and the obvious remedy is the use of a concrete of great density, which will be as nearly impervious as practicable. As fine sand should be omitted from this concrete, and a screened coarse sand would in most cases make the mixture too costly, the use is suggested, where possible, of a good puzzolanic material, which assures a mixture of great density when ground in with the cement.

In a recent number of London *Engineering* Mr. J. Watt Sandeman, M. Inst. C. E., writing on this subject, asserts that he has had abundant proof of the permanent stability of dock and pier works he has built of impervious concrete. He fails to say how long these structures have been standing, so that in the absence of that information and in consideration of the La Rochelle results his assertion will have to be accepted with some reserve. He submits four tables of proposed standard proportions for concretes, two of which are for sea works; one giving mixtures for certain specified special parts of such works, and the other giving mixtures for such structures as sea piers and dry docks, reservoir walls, etc. Since the maximum of life for such structures, according to present knowledge, is proportionate to the degree of imperviousness of the concrete, these tables will be received with interest.

PRESSED STEEL IN CAR CONSTRUCTION.

In its issue of January 19 the *Railway Age* took exception to some statements made in an editorial on "Car Building in 1905," which appeared in these columns on the twelfth of January, and made it appear that we were preaching "a pressed steel funeral sermon." The paragraph most severely criticized said:

"The use of pressed steel shapes is becoming less each year. Most of the steel cars built last year had structural steel underframes or sills built up of plates and angles."

The *Railway Age* says:

"The *Railroad Gazette* fell into error doubtless by not studying more closely the detailed statistics of cars ordered during 1905, published in the *Railway Age* of January 5. The Pennsylvania ordered 50,000 cars, the Baltimore & Ohio 10,000, the Harriman Lines 10,000, the New York Central Lines 4,000; a total for the four systems of 74,000 cars, all of which were specified to be built of pressed steel or with pressed steel underframes. We are informed on the authority of manufacturers who know what they are talking about that among the cars enumerated in our tables, 81,143 are known to have been specified to be built of pressed steel or to be equipped with pressed steel underframes. Doubtless some small items have been omitted, and the real facts, if they could be known, would show that the number is closer to 100,000 than to 80,000. Furthermore, a careful checking of our freight car list for 1905 by competent authorities places the number of cars in that list known to be of steel at 148,493. That is to say, that of the total number actually known to be specified for steel construction, at least 55 per cent. called for pressed steel."

If we fell into error by not studying our contemporary's detailed statistics, we are thankful that we did not look to them. Had

we given them study we might have fallen into almost as serious errors as has our contemporary. It is quite true that the Pennsylvania ordered a large number of steel cars last year, but not all of them were equipped with pressed steel underframes. At least 8,500 were class G1a hopper cars, having structural steel underframes, this design having been adopted as standard by the Pennsylvania some time ago. It is also interesting to know that all of the recent designs of other classes of cars for this system which employ deep pressed steel center sills have reinforced flange angles riveted to the webs giving a flange on each side of the web. The Baltimore & Ohio still uses pressed steel sills for box cars, but the most recent designs of gondolas have sills built up from flat plates and angles, and in the standard hopper cars, channel center sills are used. Of the 10,000 cars ordered by this company which our honored contemporary says were to be built with pressed steel underframes, 6,500 are known to have been ordered with structural or built-up sills. The Harriman lines ordered 10,000 cars in 1905 with pressed steel underframes under a royalty agreement with the Pressed Steel Car Co., but of this number only 3,745 were delivered up to the end of the year; and it should be remembered that we were not basing our statement on the number of cars *ordered*, but on cars BUILT. This was made clear in the editorial to which the *Railway Age* took exception. The Lake Shore ordered 4,000 steel cars, but the drawings of these cars show them to have channel center sills. If we deduct from the total given by the *Railway Age* the number of cars erroneously included in its figure and calculate the per cent. of the total by their estimate, the result is nearer 30 per cent. than 55 per cent. *specified* to be built of pressed steel. It may be well to define here what we mean by pressed steel underframes. The generally accepted definition of a pressed steel underframe is an underframe in which the principal members (the longitudinal sills) are formed from one piece of plate and pressed into the desired beam section with forming dies; the section may be a Z or a channel.

There are only three car building companies equipped for making pressed steel underframes. Three other plants built cars with pressed steel underframes which were bought from one of the three makers. The combined output of cars of pressed steel construction by five of these companies in 1905 was less than 11,000 cars, and the output of the other one company was but little more, which makes the total figure for pressed steel cars built in 1905 about 30 per cent. of the total output, or in the same proportion as cars ordered. The five builders first mentioned each built a much larger number of cars with structural steel underframes than with pressed steel underframes, and the other one built several thousand cars with structural underframes.

The real tendency in car construction cannot be shown by totals and per cents. The surest indication is the development of new designs, the change from one type of construction to another. When the Pennsylvania adopts structural construction for hopper cars, and is obliged to reinforce its pressed steel designs with angles riveted on the flanges, when the Baltimore & Ohio goes even farther and designs new cars with sills built up of flat plates and angles as in any plate girder, and when almost without exception every new design brought out last year by other railroads and by all but one of the large car building companies employed structural or built-up sills we think the statement that "the use of pressed steel shapes is becoming less and less each year," is entirely justified by the facts. Again, our friendly contemporary, in concluding its obituary based on our "pressed steel funeral sermon," places the *Railroad Gazette* in a false light as to its attitude toward the use of steel in car building. We have never argued against the use of steel in any form in that industry.

NEW PHASES OF RAILROAD FINANCE.

The observer of railroad finance who, during the last half decade, has seen the periodic upward flights of railroad securities in the stock market, has also had opportunity for some acute historical contrasts. His records, and if he is old enough, his personal memories, go back to earlier days, when a few railroad stocks and a very occasional bond—at a high interest rate—comprised the whole Wall Street list. Next he finds a time when stocks have somewhat subdivided into common and preferential, and bonds separated, too, into classes. And so moving down the years he reaches the present impressive epoch with its multiplied groups of bonds—of late expanded into the "short note" idea—common stocks that a few years ago were far behind the preferentials now soaring far above them and the convertible debenture coming to have a place of its own. Variety, volume, novelty are the characteristics of the railroad security market; and their bearings both on investment value and on the future of railroad financing becomes a subject worthy of thought.

When we speak of investment values we, of course, refer to values that are genuine, and to the investor in railroad securities who seeks real values. We do not refer to "flat" values or to the mere speculator who buys them for a turn, and who may be called the creature of a day. But, taking even this test of a value more or less genuine, and of an investment that is not transitory, the railroad investor of to-day faces some rather confusing conditions. Great railroad corporations continue to pour out new issues of bonds, most of them necessarily of the junior type, the legal limit of the senior mortgage having expired long ago. The company itself is showing probably immense earning power, and the new securities range pretty high in the market. But the investor has had no test of experience by which to make his forecast for a long investment. No such conditions of immense railroad expansion and systematic consolidation have ever faced him before, and in the vast diversity of securities alone there is perplexity. He has considerable reassurance in the fact that the new funds are going into actual improvements, not a few of them meaning increased earning power, and that consolidation of railroad properties means more economical operation. On the other hand, he sees the "terminal improvement" in great cities coming more and more into the foreground. It signifies the acquisition of lands and stations of great intrinsic value, but which, for many years, can add very little to net earning power. Or take again the convertible debenture which figures more and more in railroad financing. Here the investor has to make his "bet" for a long time or short, as the case may be, on the value of convertibility. Often, as in the case of the New Haven debentures of 1903, or the St. Paul or Union Pacific convertibles, the bet has been a profitable one, but it is a bet just the same.

Conservative railroad investors in their relation to the general subject here under consideration may be divided into two classes. The first class, whom we may call the ultra-conservatives, and which includes trustees and savings banks bound by investment statutes, find relatively few difficulties in the present situation. The double gilt-edged type of railroad bonds are still in the market in considerable volume. They have been amplified by refunding into the general consolidated mortgage class of bonds; and even some of the old long sixes and sevens still outstand. So long as this group of investors confine themselves to such railroad securities and are content with an annual return ranging from 3.5 to 3.7 per cent., the present situation is simple, even alphabetical. Not so with the vastly larger, but yet conservative, group seeking the railroad investment that ranges from a 4.1 per cent. return upward. For them the complexities of the railroad bond market have become very positive facts, exacting acute judgment. For the last few years they have been passing through a veritable campaign of education not yet ended. To secure a good railroad bond returning, say, 4.5 per cent., requires, if we may so put the case, twice the fiscal brain matter that it did ten years ago.

The boom epoch of voluminous issue of railroad securities has also its suggestive bearing on the railroad property itself as well as on the investor. The reassuring facts here are, generally speaking, the expenditure of the derived funds in concrete ways—improvements and new equipment both, as a whole, increasing earning power, net as well as gross. Nor do the chills and fevers of the Street on the ups and downs of stocks affect the good steel rail once laid, the train-load of improved cars or the bedrock value of the new bridge structurally perfect. Nevertheless, looking forward to that period of industrial depression which must come sooner or later, the economist must regard as perhaps its most absorbing feature what we may call the ratio of improved operation to expanded fiscal liability. In other words, how far will better roadbeds, heavier rails, stronger bridges and larger terminals offset, in bad times, the great increase of liabilities created to secure those improvements in good times? The period of prosperity and expansion has now been so long that when the new test period of reaction comes it will be by far the most instructive in our railroad annals. Incidentally, it will test as never before the policy of "cutting melons" on the one hand and conservating the dividend on the other—the new stock theory as against the new bond theory of railroad extension, each of which has its warm supporters.

Finally, in the study of the present epoch of large and varied expansion of railroad securities, must not be omitted reference to the fiscal evolution of the street railway. Exactly in form, but much faster in pace, the street railway has followed the analogy of the steam road as regards those liabilities represented by bonded debt.

There has been, though on a reduced scale, the same period of pretty high interest rate, followed, as the electric line has become an institution beyond the limbo of experiment, by a reduced rate of return on all the better classes of securities, and of late a period of very free emission of bonds. At a date not very far away we may look confidently also for subdivisions and multiplied classes of street railway debts and beyond, still, to a test period when the wisdom of creating those debts will be searched by the hard touchstone of bad times. As stated, the scale will be lower, but the process—and probably the results—of the trying out of the financing of street railways will be identical with those of the steam roads; for, though the average street railway carries a much larger burden of watered stock—and, often, watered bonds—it has also, as partial offset, its amazing increments of traffic.

An Important Arbitration Decision.

A question of considerable interest and importance in its bearing on the interpretation of agreements or contracts between railroad companies and their conductors, trainmen, enginemen and firmen was settled in Colorado by arbitration week before last. When the Colorado Springs & Cripple Creek District Railway and the Midland Terminal Railway were consolidated last summer, General Manager Waters of the consolidated lines reorganized the train service of the two in conformity with the purpose to operate them as a single line. In the execution of this purpose a joint service of train and enginemen was established, retaining such portion of the employees of each line as was requisite to the traffic requirements of the unified lines. Also, the "Short Line" (C. S. & C. C. D.) schedule, which was more favorable as to rates and conditions than the Midland Terminal schedule, was extended over the latter line. As far as practicable the men of each line were permitted to continue on the runs held prior to the combination, but where conditions of service required, Midland Terminal men were sent temporarily or permanently to the "Short Line" and vice versa. "The Short Line" men objected to any such transfer of men, holding that it was a violation of the arrangements with enginemen and trainmen regarding their rights to preferment entered into with the management of their road prior to the consolidation. In other words, they objected to men from the Midland Terminal being assigned to rights and standing on the C. S. & C. C. D. over men older in the service of that road. They wanted the employees of the two lines kept separate, just as when the roads were independent of each other; and if the demands of the service necessitated Midland Terminal men being brought to the "Short Line," they must quit the former and be hired on the latter as new men under the 50 per cent. clause.

As a matter of fact, the Midland Terminal is five years older than the "Short Line," but General Manager Waters recognized that the employees of the younger line had seniority rights acquired thereon which he desired to regard as fully as was compatible with the new conditions, and as they had declined to join the Midland Terminal men in preparing a seniority list for his use, he adopted a plan that was more than fair to the "Short Line" men. He permitted the senior man on this road to retain his rank, regardless of the line on which he served, putting the oldest Midland Terminal man second on the joint-service roster, and thus alternated the men down the list until the requisite force had been made up.

But despite its magnanimity, this arrangement was not acceptable to the "Short Line" men and they appealed to the grand officers of their respective national organizations. Efforts of these grand officers and committees representing the conductors, trainmen, enginemen and firemen to have the management acquiesce in their views and modify the organization in accordance therewith lasted through the fall without any settlement being reached. The situation became considerably strained, and, in fact, reached a stage where the possibility of a strike was indicated. However, at this point, which was early in January, an agreement was reached by General Manager Waters and the committees to refer the matter to a board of arbitrators composed of three members, the question to be arbitrated being substantially as outlined in the foregoing, regarding the right of the general manager of the consolidated lines to transfer men from one to the other and accord them the standing described without violating the agreements dated prior to the consolidation and claimed still to be in effect on the C. S. & C. C. D. It was agreed that in case of a decision for the company, the roster already made up should obtain; but if in favor of the men, the employees would be returned to their respective properties with their former rights and standing.

Mr. W. E. Symons, late Superintendent of Machinery of the Kansas City Southern, was chosen by the company, and Mr. P. H. Morrissey, Grand Master of the Brotherhood of Railway Trainmen, was chosen by the employees. These two agreed upon Mr. Charles Dyer, of Denver, formerly General Superintendent of the Colorado & Southern, and now engaged in business, as the third member. After a careful hearing of the evidence and argument the Board of Arbitrators sustained the general manager, basing their decision on the doctrine that unless rates of pay were reduced or other similar loss or hardship resulted from the joint service, no violation of argeement existed; the changed conditions not only giving the general manager the right but making it his duty to reorganize the two forces into an efficient unit. In accordance with their agreement, the men accepted and will abide by the decision.

Another step in tightening the control of the New York, New Haven & Hartford road over the electric railroads of Connecticut and in lessening the possibilities of through electric competition was taken last week in the New Haven's purchase, through its holding company for electric properties, the Consolidated Railway, of the property and franchises making up a proposed through electric line from Hartford, Conn., to Worcester, Mass. The new line was to have been built by interests in control of the Boston & Worcester Street Railway, which operates a double-track electric line from Boston to Worcester. About a year ago they bought the Hartford, Manchester & Rockville Tramway, which owns a line from a connection with the Hartford Street Railway, over whose tracks it has running rights into Hartford, to Rockville, Conn., 16 miles northwest of Hartford. The new owners immediately announced their intention of filling in the gap of some 50 miles between Rockville and Worcester, and operating a high-speed trolley line all the way between Boston and Hartford. The new line was projected by way of Stafford Springs, a point in Connecticut northwest of Rockville and near the Massachusetts line. The New Haven's purchase includes the Hartford, Manchester & Rockville company, the partly-built line from Rockville to Stafford Springs, and the rights to complete the line into Worcester. This purchase brings under the control of the New Haven road a short electric line which parallels one of its branches and makes its ownership of the electric railroads of Connecticut even more secure. As yet the Connecticut Railway & Lighting Company, with its 125 miles of main track, and controlling the electric systems of Bridgeport, Waterbury, New Britain, Norwalk, Ansonia and Derby, and a through line from Stamford to Seymour, 42 miles, paralleling the New Haven's New York division from Stamford to Bridgeport, has not been taken over, but that this will sooner or later be the outcome of Mr. Mellen's electric campaign can hardly be doubted. An interesting feature of the new purchase lies in the fact that the projected line threatened not so much the New York, New Haven & Hartford as the Boston & Albany, whose line the Boston & Worcester already parallels over the first 44 miles out of Boston. Successful operation of the complete Worcester-Hartford electric line would have hurt the Boston & Albany on its 99-mile Boston-Springfield haul more than the New York, New Haven & Hartford on its 26-mile haul from Springfield to Hartford. Nevertheless, even this threatening of one part of the New Haven's monopoly was enough to persuade that company to take over the new line at a price which afforded a good profit to the Boston & Worcester interests.

The railroad commissioners of Vermont, in reporting recently on a grade crossing accident, killing two persons in an automobile, declare the Rutland Railroad partly at fault, because the engine of the train was running backward. If it had been running "chimney in front" (as the English say) the engineman's view would not have been obstructed by the tender and he would have been on the inside of the curve at the point of the accident instead of the outside; and if he had been keeping a good lookout could have so slackened speed as to give the automobile time to cross in safety. The driver of the automobile (and all the persons in it) were very careless and the commissioners justly hold that he was primarily at fault. He was traveling faster than the law allows and took no pains to look out for crossings. But "the Rutland Railroad Company at the time of the accident was operating its train in an unsafe manner. To draw a train with engine backing is a dangerous practice and is excusable only in cases of necessity. The Rutland Railroad Company from choice has elected to so operate the engine on this train (a very short run) for more than two years last past. There are facilities at North Bennington for turning the engine but upon the plea of congested yards the "Y" has been used for storing cars and not left open for the uses for which it was originally intended. . . . It is therefore ordered that on and after the first day of February, 1906, said Rutland Railroad Company cease to operate its passenger and freight trains on the Bennington branch except with the engine ahead and headed in the direction in which the train is to proceed, unless permission in writing to otherwise operate its trains on the Bennington branch is first had and obtained of the Board of Railroad Commissioners of the State of Vermont." At any but very moderate speeds, running the tender ahead is in many cases dangerous to the train, as well as to vehicles crossing the track. Whether or not the Vermont commissioners took this other danger

into account, does not appear; but the strong language used would seem to indicate that they did. Whether it be from poor design or maintenance, making the tender truck unfit to curve, or from a top-heavy or ill-balanced load of coal or an unstable load of water, tenders do jump the track, when no other cause is discoverable, and cases of this kind help to swell the column of "unexplained" derailments in the accident records. It would have been a good thing if the Vermont commissioners had embodied in their report a deeper study of the subject.

At Ormond, Fla., January 24, an automobile was driven five miles on the beach in 2 minutes, 47 seconds; or at the rate of 107.8 miles an hour. This was at the races held under the auspices of the American Automobile Association. The machine was a 30 h.p. Stanley steamer, and it was driven by Fred Marriott. There was a strong north wind, which helped the drivers to make high speed. Marriott, as well as his competitors, made a rolling start. On the 26th, Mr. Marriott broke the record for one mile and for one kilometer, traversing a mile in 28⅕ seconds (127.7 miles an hour), and the kilometer in 18⅖ seconds; and on the 29th Victor Demogeot, with a Darracq 200 h.p. motor, made two miles in 58⅘ seconds (122.4 m.p.h.). The speeds made in these, and other trials on the Florida beach, are spoken of as "the fastest time ever made by anything on earth," but the report of the experimental runs with electric cars made on standard railroad track, between Berlin and Zossen, Germany, in 1903, says that a speed of 210 kilometers (130½ miles) an hour was reached at that time (Oct. 27; *Railroad Gazette* Nov. 20). For how many miles this rate was kept up is not recorded; for the whole distance of 14.3 miles the rate was 107 miles an hour.

NEW PUBLICATIONS.

Railway Signal Association. Proceedings for 1905. H. S. Balliet, Secretary, 335 Madison Avenue, New York City. Single copies, 25 cents.

This is a book an inch thick, and the body of the report takes up 360 pages. It contains the full reports of the meetings of January, March, May, September and October. All these were given, in briefer form, in the *Railroad Gazette*. The standard specifications for mechanical interlocking and material for construction work are given in this report, and the heading says that they were adopted by the association on October 11, 1905. The report on organization of the signal department, which was presented at the October meeting, contains 29 diagrams showing the organizations of that number of prominent roads. The Secretary's reports of the several meetings are in brief form, occupying only 32 pages for all the meetings of the year; and the papers read at the several meetings, with the discussions on them, are given by themselves in the pages following the reports of the meetings. All the matter on a given subject is collated by itself, so that a topic which has engaged the attention of two or more meetings can be found in one chapter.

Welfare Work. By H. H. Vreeland. Issued by the National Civil Federation, 281 Fourth Avenue, New York City.

This is a little pamphlet of only 24 pages, 5 in. x 7 in., but it contains much more material than many a book five times its size. Mr. Vreeland is the well-known President of the New York City Railway Company, operating the surface street railroads of Manhattan, New York City, and the pamphlet is the record of an address which he gave recently before the New England Cotton Manufacturers' Association. Mr. Vreeland is nothing if not practical, and without the least rhetorical flourish he has packed his address full of actual examples of good work done by large manufacturing and mercantile establishments for the comfort of their employees when the employees are not on duty. The pamphlet has pictures on nearly every page, so that he who runs may read—by pictures. Among the pictures are a girls' lunch room at the cash register factory in Dayton, Ohio; a street railway employees' pool room in New York City; a can for keeping drinking water cool on Pennsylvania Railroad locomotives; the physical exercise department for girls and women in a New York department store; an athletic field for the employees of a factory in Plymouth, Mass., and a cottage such as the Ludlow Mills, at Ludlow, Mass., rents to its employees, contrasted with a view showing how factory employees live when the company leaves them to their own devices. Mr. Vreeland calls attention to the fact, sometimes lost sight of, that the cotton mills of New England were among the earliest concerns in the country to do "welfare work" for employees. Building their factories along the streams remote from the cities, they had to build comfortable tenements in order to keep their workmen. Mr. Vreeland declares that welfare work in large cities may be profitably extended to "careful, sympathetic and unobtrusive efforts to brighten the homes" of the workers. Mr. Vreeland in his youth had to live in a boarding house where he had no warm room in which to sit in the evening, and his sympathy with young unmarried persons who work in cities is therefore of the most practical sort.

TRADE CATALOGUES.

In 1894, the Master Car Builders' Association, for convenience in the filing and preservation of pamphlets, catalogues, specifications, etc., adopted a number of standard sizes. The advantages of conforming to these sizes have been recognized, not only by railroad men, but outside of railroad circles, and many engineers make a practice of immediately consigning to the waste basket all catalogues that do not come within a very narrow margin of these standard sizes. They are given here in order that the size of the publications of this kind, which are noticed under this head, may be compared with the standards, and it may be known whether they conform thereto.

Standards.

Postal-card circulars	3¾	in. by	6⅛	in.
Pamphlets and trade catalogues	3½	" by	6	"
	6	" by	9	"
	9	" by	12	"
Specifications and letter paper	8¼	" by	10¾	"

Tie Plates.—The Beaver Dam Malleable Iron Co., Beaver Dam, Wis., sends a pamphlet describing its malleable iron tie plates. Four different styles of plates are illustrated and described, including a shouldered, longitudinal flange plate; a somewhat similar design with beveled ends; a flat bottom plate, and a "pierce" plate with transverse flanges of peculiar construction for tight holding. There is also a combination tie plate and rail brace and the Beaver Dam standard rail brace, of malleable iron. The pamphlet is artistic in design.

Variable Speed d.c. Motors.—Bulletins Nos. 3 and 4, issued by the Lincoln Electric Manufacturing Company, Cleveland, Ohio, illustrate and describe in detail the Lincoln variable speed motors. These motors are made in various sizes, with speed ranges from 2 to 1 to 10 to 1, and greater if required. They give a constant h.p. output at all speeds when running in either direction and are made to operate on 110, 220 and 500-volt circuits. The illustrations show the motors as applied to machine tools.

Woodworking Machinery.—The essential features of two heavy woodworking machines are described in circulars issued by the S. A. Woods Machine Co., Boston, Mass. One of these machines is a car-sill dresser and the other is a planer and matcher. Both machines are especially useful for railroad and car shop use owing to their adaptability for dressing heavy trailer and planing and matching boards with equal despatch.

CONTRIBUTIONS

The Care of Locomotive Boilers.

Logansport, Ind., Jan. 26, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The writer was greatly impressed by the paper on the "Care of Locomotive Boilers" by M. E. Wells in the *Railroad Gazette* of January 19. I believe that too much emphasis cannot be laid upon his remarks regarding the effect of cold feed water upon the flues and firebox sheets. He disposes very briefly of the theory that cold air is responsible for flue leaks, and rightly so, for the air from the firedoor has to pass for 9 or 10 ft. over a fire at about 3,000 deg. Fahr. before it comes in contact with the flue sheet, which is never above 500 deg. Fahr. When an engine has been standing for some time and the fire becomes dead in spots, it is perhaps possible to injure the flues if the rake is not used on the fire before putting on the blower, owing to cold air coming through the grate. But the specific heat of air is so low, and owing to its low conductivity the transfer of heat to or from it is so slow that the effect of cold air on the boiler is negligible compared with the temperature changes produced by cold feed water.

As Mr. Wells points out, hot and cold water will not mix in the boiler unless aided by the mechanical effects of circulation and the motion of the engine. There is a striking contrast between the great care taken by the builders of stationary boilers to distribute the feed water inside, and the common locomotive practice of dumping it in through a check valve on the side of the barrel, where it at once falls to the bottom and passes to the throat still cold.

The writer knows of some engines which have the checks on the back head, and when received from the builders, the pipe which runs forward inside the boiler terminated over the nest of flues about 3 ft. from the front flue sheet. Trouble was soon experienced with the mud deposit which formed on the flues under the end of this pipe, and it was therefore bent to one side so as to discharge against the side of the boiler outside of the flues. When this was done, some trouble was experienced with leaky flues in the bottom rows, where there had been practically none before. Placing the checks on the back head of the boiler is in many respects an ideal practice, and if the pipe running forward inside the boiler were stopped at the end and fitted with a number of small horizontal branches below the water line, each branch having an elbow on the end turned upward, the result would be a

thorough mixing of the feed water with the hot water in the boiler, and the heavy deposit of mud on the flues would be avoided. The writer is convinced that relief from the present serious boiler troubles lies only in soft water, reasonable care in the use of the injectors on the road, and eternal vigilance from the time the locomotive comes on the cinder pit till it is ready for the road.

OBSERVER.

To Do Good Work in a Poor Yard.

Hartford, Conn., Jan. 30, 1906.

To the Editor of the Railroad Gazette:

We are hearing a whole lot nowadays about yard operation. Much of it no doubt of interest to those who don't have to directly run yards, but not so much to the poor fellow who is "against it," who has to tell the old man several times a day why and wherefore cars are not moving as they should, or why penalty cars are now and then overlooked. If some kind expert would tell us of better ways and means of transmitting information from the agent to the yardmaster, and checking delivery of same, as well as some good way of following up orders once delivered, he would confer a favor on the man lower down. It is not the ninety and nine cars which are moved promptly that we care so much about, but the one poor stray penalty that hurts. How to save him is the real question. Our expert friends say but little about the necessity for moving empties, and yet Mr. M. T. is the very fellow who needs prime consideration, for if you can keep him out of the way—and he can be kept out of the way only by keeping him moving—you will not have much trouble in keeping your yard O. K.

We must look outside the yard, however, for much that is necessary to help yard working. If trains are put in shape at their starting point, and kept so during the trip, much work will be saved in yards. If a car has to be taken on at an intermediate point there is seldom a good reason for not putting it in the train with other cars of the same classification. Again, running freight trains on a schedule will help the yard situation immensely. Any yardmaster will tell you that it is the "bunching" of trains that plays the mischief with his calculations. Give him trains at fairly regular intervals, and he will take care of them with but little trouble and considerably less yard power than if trains come in irregularly.

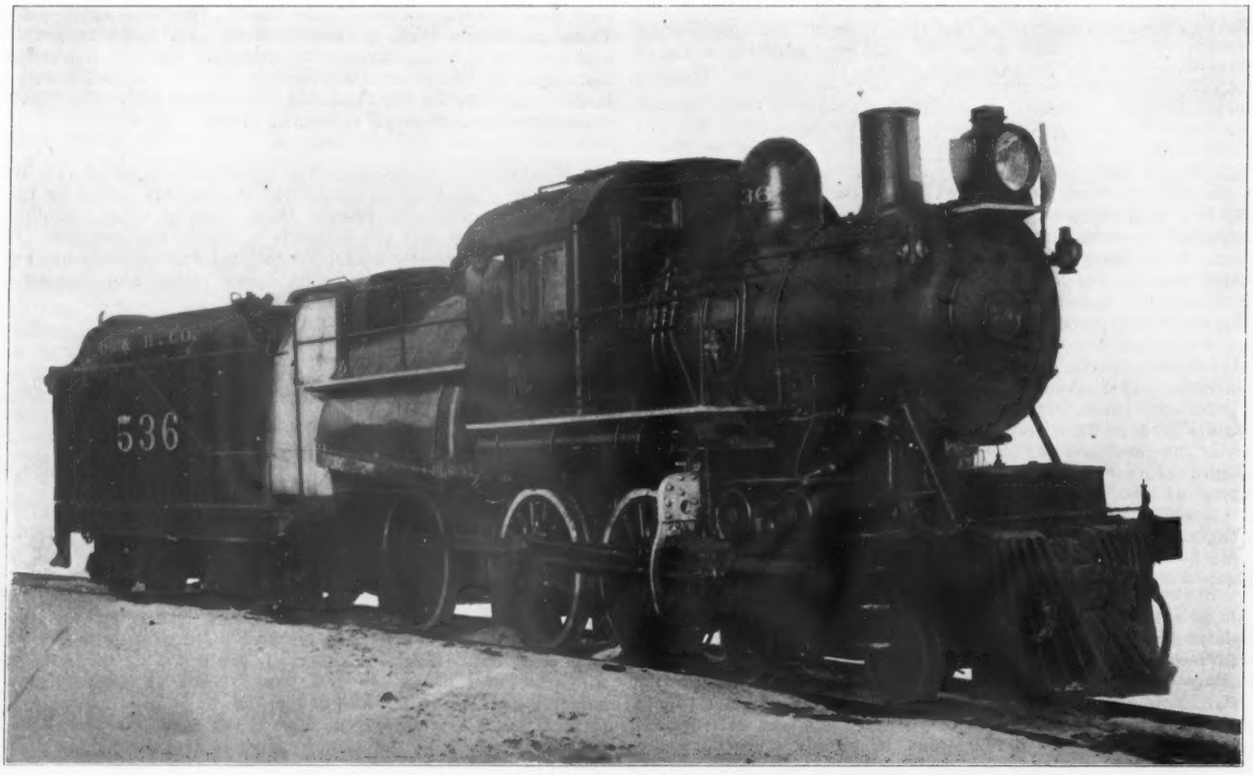
Many yards are not as well worked out in detail as one could wish, but, like the poor, they are with us, and just as likely to stay. Many yards cannot be revised, except at prohibitive cost. In such yards, brain power of the best quality must be used in devising operating methods which do not need big outlays for their accomplishment. Perhaps another switching lead, so that two engines could work without interfering, would help out, or a short track for holding cripples (which are made so after classification) might save the time of a train taking on cars. Perhaps the caboose is more or less troublesome, and would be more out of the way, and give the road boys a little better chance to get a few winks of sleep, if it were placed somewhere out of the line of regular switching movements, and yet where it could be reached easily for outward road movement. Perhaps a machinist on the ground regularly would help keep switch engines running all day by a touch here and there, when otherwise they would be forced to go to the shop for an hour or two. The re-location of a water plug, at which an engine fouls two or three tracks, or a lead, would help out, and doesn't cost much.

But all these things cannot take the place of good organization, without which the best physical arrangement of yard is of little use; while with good organization the poorest track arrangement can be made to do fairly good work.

W. L. D.

Delaware & Hudson Locomotives With Young Valves and Gear.

The Delaware & Hudson has in service two ten-wheel (4-6-0) freight locomotives equipped with the Young valves and gear, which have been running since Nov. 21 and Dec. 24 respectively. They are intended for fast freight service and are the first freight locomotives to which this gear has been applied. A full detailed description of the Young mechanism was given in the *Railroad Gazette* Nov. 4, 1904, together with the results obtained on a Chicago & North-Western Atlantic type locomotive running in the fastest and heaviest passenger service of that road. Since that time only one important change has been made in the valve, which is illustrated herewith. The valve on the North-Western engine had two of its packing strips T shaped in section and 1¾ in. wide on the face. Each of these is replaced on the present valve by two strips as shown, which reduces the width of bearing surface ½ in., thereby materially reducing the friction. Also the narrow strips are constantly self-facing.



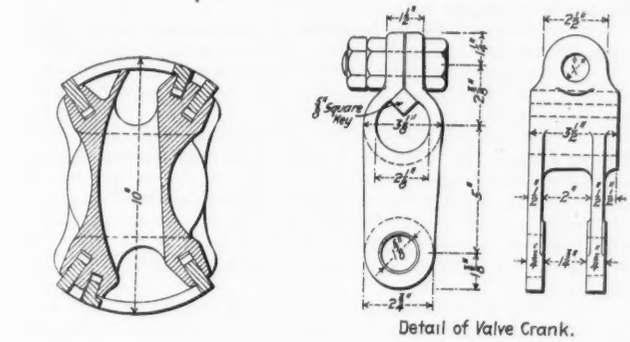
Ten-Wheel (4-6-0) Freight Locomotive with Young Valves and Gear—Delaware & Hudson.

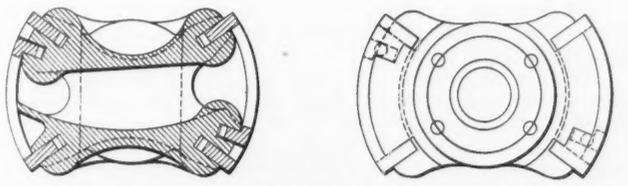
Another detail which has been improved is the valve crank. This was formerly made solid and keyed on the spindle with a drive fit. This made it hard to get off, so the change was made as shown herewith, a clamp fit being used instead, with a key.

The detail of the lead rod also is shown. In the older arrangement there was an auxiliary tumbling shaft across the back of the saddle, to which the wrist-plate bearings were connected. The auxiliary tumbling shaft had connection with the main tumbling shaft through a single reach or lead rod midway between frames, pivoted to a short arm fixed rigidly on the main tumbling shaft. In the present arrangement the auxiliary tumbling shaft is done away with, there being a lead rod to each wrist-plate bearing, which at

its back end is pivoted to the link lifting arm as shown. The two rods are tied together and braced across to make them in effect a single piece.

The valves are set for a constant steam lead for all cut-offs, and for ¼ in. more exhaust lead at a 6-in. cut-off than in full gear; that is, they have ⅛ in. inside lap at full gear, changing to ⅛ in. clearance at 6-in. cut-off. These locomotives have 21-in. x 26-in.

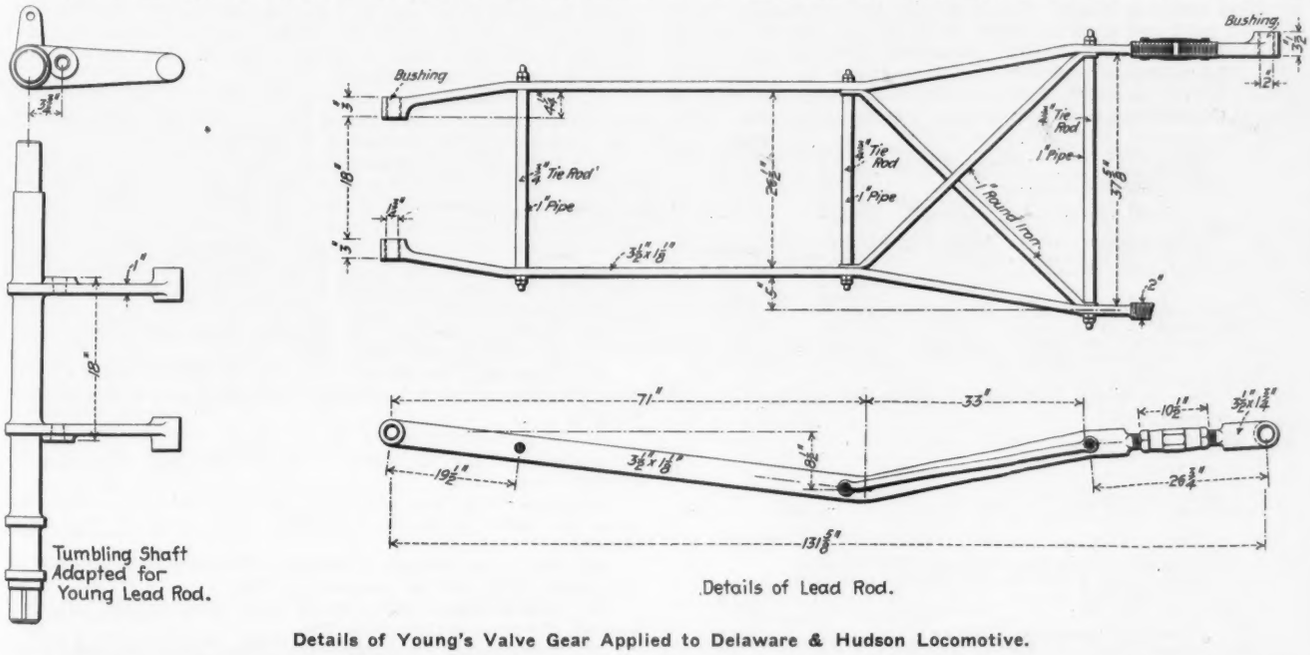




Sections and End View of Valve

cylinders, weigh 130,000 lbs. on drivers and 173,000 lbs. total. They carry 200 lbs. steam pressure and have 63-in. drivers. One of them has been in milk train service for some little time, which has a passenger train schedule, and we understand its performance has been most satisfactory. The other, although intended for fast freight service, has been pulling "drags" in company with consolidations and has also given a good account of itself. The locomotives were built at the railroad's shops.

In this connection it is of interest to mention that the passenger locomotive of the North-Western already referred to ran 133,000 miles before shopping, during which time the tires were not turned, and a $^1/_{16}$-in. cut trued them up when the engine finally went to the shop. Other locomotives of this same class with the usual valves and gear have their tires turned three and four times between heavy repairs, which occur on a considerably less mileage than the above.



Details of Young's Valve Gear Applied to Delaware & Hudson Locomotive.

It may be news to most of us that China has any railroad magnates; but we are now assured that one has not only risen but fallen. This is Sheng, once Vice-President of the Ministry of Public Works, and till recently General Manager of the Nanking & Shanghai Railroad, 16 miles of which were recently opened for traffic in American style, with a speech by an adopted son of the late Li Hung Chang. Of Sheng the North China *Daily News* says: "With Sheng disappears doubtless one of the most unscrupulous of all mandarins from the political field. When he had an object to gain, and especially when he feared the loss of his position, he never hesitated a moment to sacrifice a part of his accumulated millions. We all know how much money will do in Pekin." The Ministry recommends the Government to seize the property of Sheng and hold it until an investigation of his conduct of affairs has been made. The accused "happened" to be far distant when he was removed, and a stroke of apoplexy, so his friends say, followed his receipt of the news. His successor is the Mandarin Tang.

Washington Correspondence.

WASHINGTON, Jan. 30.—Debate on the Hepburn railroad rate bill is under way in the House without any special order fixing its limit, but with a general understanding that the vote on the passage of the bill shall be reached about Tuesday or Wednesday of next week. No restriction has been placed on the offering of amendments, as it has been assumed by the House leaders that, the report of the Committee on Interstate and Foreign Commerce having been unanimous, any amendments objectionable to the committee would be voted down. It is not probable that any material amendment will be adopted unless it be one strictly prohibiting the giving of free passenger transportation. The bill will pass the House by an overwhelming majority.

At the Senate end of the Capitol there are indications that progress is being made slowly in the direction of an agreement on a compromise bill that will be able to secure the votes of a majority of the Senate. It is not possible at this time, however, to predict just what that measure will provide, though it seems certain that it will give the courts much more power than is proposed by the Hepburn bill, and will make it possible to have the question of the reasonableness of a rate that has been challenged passed upon at some stage of the proceedings. The idea is gaining ground among Senators that there would be doubt as to the constitutionality of a law that would give the Commission authority to fix a rate and put it into effect without giving the carrier an opportunity to have the question of the reasonableness of the condemned rate or the reasonableness or legality of the order of the Commission passed upon by a United States court. As a consequence of this, the plan of having the question of the reasonableness of the challenged rate passed upon by a court in the first instance, as is proposed by the Foraker bill and the compromise plan of Senator Elkins, is gaining strength. It is impossible to say whether it will be the basis of the final compromise, but it is significant that Senator Knox, of Pennsylvania, who has been understood to be one of the strongest supporters of the President, is not satisfied with the Hepburn bill and believes that some provision will have to be made under which it would be possible for the question of the reasonableness of the original rate and of the reasonableness and legality of the order of the Commission to be passed upon by a court.

The importance of the resolution adopted by the House of Representatives on Monday requesting the President to send to the

House all the facts within the knowledge of the Interstate Commerce Commission showing or tending to show a combination or arrangement in violation of the anti-trust act between the Pennsylvania Railroad Company, the Pennsylvania Company, the Norfolk & Western Railway Company, the Baltimore & Ohio Railroad Company, the Philadelphia, Baltimore & Washington Railroad Company, the Northern Central Railway Company and the Chesapeake & Ohio Railway Company, has been much magnified. The resolution does not call for an investigation, but only for a report of the information now in the possession of the Interstate Commerce Commission. As the Commission has no information on the subject other than that which has been made public in the annual reports of the several companies involved in the resolution, its report will not add anything to what is already known on the subject. A resolution requesting the Attorney General to report as to why proceedings had not been brought against the Pennsylvania and the other roads, such as was suggested in the Senate on Monday by Senator Tillman, would be a matter of much more importance than the House resolution.

This suggestion was made by Senator Tillman in discussing a letter from the Red Rock Fuel Company, of Philadelphia, that he had had read in the Senate. This company complained that the Baltimore & Ohio road had refused to permit a side track to be built from its line to the tipple of the coal company in Upshur County, W. Va., and said that the road had announced its intention to disregard an order of the Interstate Commerce Commission requiring it to permit the side track to be built. The impression created by the sending of copies of this letter to Senators and Representatives was that the situation shown illustrated a case in which, under the present law, a railroad could discriminate against shippers and no effective remedy could be obtained. The letter said nothing of the fact that either the fuel company or the Interstate Commerce Commission could apply to a United States court for a mandamus to compel obedience to the order of the Commission, nor did it reveal the fact that the company has already commenced proceedings in court.

J. C. W.

Progress in the Use of the Block System.

On the opposite page is a table bringing down to January 1, 1906, the statistics of railroad lines in the United States on which the block system is in use. This is the fifth table of the kind which we have published, those of former years having been issued January 11, 1901; February 27, 1903; January 22, 1904, and January 27, 1905. The mileage of road as shown in the tables for the last three years amounts to 50,088, 44,575, 39,264, respectively, the miles of road of the different classes on January 1 being as follows:

	1906.	1905.	1904.
Automatic:			
Single track	1,780.8	1,333.3	964.6
Double track	3,952.6	3,420.2	3,125.7
Four track, etc.	465.2	362.8	301.0
Total	6,198.6	5,116.3	4,391.3
Manual:			
Single track	36,326.4	31,864.5	28,508.2
Double track	7,032.1	6,928.7	5,796.3
Four track, etc.	767.6	767.3	702.6
Total	44,126.1	39,560.5	35,007.1
Total automatic and manual	50,324.7	44,676.8	39,398.4
Deductions*	237.1	102.1	134.5
Total on which block signals are used	50,087.6	44,574.7	39,263.9

*For lines entered twice.

The lines on which block signals ordinarily are used only for passenger trains are:

Buffalo, Rochester & Pittsburg	505.3 miles.
Chicago, Milwaukee & St. Paul	4,320.3 "
Grand Trunk	197.9 "
Michigan Central	113.0 "
Norfolk & Western	198.0 "
Southern	6,438.3 "
Total	11,772.8 miles.

Deducting this mileage from the total (50,087.6) given above, leaves a final net total of lines constantly block signaled, of	38,314.8
Same, one year ago	32,818.1
Showing an increase for the year of	5,496.7

The present total is divided as follows:

Automatic	6,198.6
Manual	32,116.2

In the following paragraphs explanations are given of certain items in the table, the numbers affixed to the paragraphs being references to the names in the table.

NOTES ON THE TABLE.

3. *Alabama Great Southern.*—The proposed new signaling is on the line between York, Ala., and Meridian, Miss. The signals are automatic semaphores and are expected to be ready to go into service February 1.

4. *Atchison, T. & S. F.*—Of the manual signaling 32.9 miles is electric train staff. The proposed new signals are to be automatic.

5. *Baltimore & Ohio.*—The item of 70.8 miles includes 68.3 miles of three-track line.

6. *Boston & Albany.*—The new signaling will be automatic, on the main line, double track.

7. *Boston & Maine.*—The proposed new work (26 miles) means 30 miles on one of the two main tracks on the Fitchburg division, where one of the tracks is already signaled; and 11 miles of double track on the Western division. Both installations will be automatic signals.

8. *Buffalo, Rochester & Pittsburg.*—Block signals usually used for passenger trains only.

9. *Central of Georgia.*—Includes six miles used jointly with Atlanta & West Point and six jointly with the Southern Railway.

10. *Chesapeake & Ohio.*—Of the single track line 256 miles has Leonard's lock and block apparatus, and seven miles is worked by electric train staff.

11. *Chicago & Alton.*—It will be noted that the length of road entered against this company is 225.1 miles greater than the entire mileage operated by the company. This is due to the fact that on some of the lines where the automatic signals have been put in, at curves or other obscure places, and where the sections are not continuous, the telegraph block system is used in addition to the automatic. In footing up the table this 225.1 miles has been deducted.

12. *Chicago, Milwaukee & St. Paul.*—The proposed new signaling is for the line between Galewood, Ill., and Elgin; double track, automatic.

13. *Delaware & Hudson.*—The proposed new work is all automatic; 24 miles single track; 54 miles double track, and seven miles three-track or four-track line.

14. *Delaware, Lackawanna & Western.*—The item of 4.1 miles against this road represents three-track line. The proposed new signaling will be automatic (electric motor signals) on double track.

15. *Erie.*—The 86 miles of new work which is contracted for, or in progress, includes 10.5 miles of automatic signals on the New Jersey & New York Railroad. The remainder is on the New York division of the main line between Bergen, N. J., and Middletown, N. Y. This line is at present worked by manual controlled signals, which will be abandoned when the automatic signals are put in use.

16. *Grand Trunk.*—Block signals used for passenger trains only. The same system is used on the company's lines in Canada.

17. *Illinois Central.*—The manual signals have an electric controlling apparatus connected from station to station. Of the 123 miles of new signaling to be done by this company 28 will be automatic electric motor signals, to be worked by portable storage batteries. This is a double track line. The remainder (95 miles, single track) will be manual controlled signals.

18. *Interborough.*—Six and one-half miles of this company's line is four-track, but only two of the four tracks have block signals. The signals are equipped with automatic stops.

19. *Lake Shore & Michigan Southern.*—Of the 51 miles automatic 31 miles is three-track line; and of the 45.2 miles manual, 20.3 miles is three-track. The new work proposed consists of automatic signals for the main line, on which the telegraph block system is now used but is being gradually displaced by the automatic.

20. *Louisville & Nashville.*—This company is reported as installing block signals on its line between Cincinnati and Atlanta, but no statement of miles equipped is available.

21. *Michigan Central.*—The manual signals are usually used for the rear of passenger trains only.

22. *Nashville, Chattanooga & St. Louis.*—The 45 miles of new signals (single) track will probably be finished and in use by February 1.

23. *New York Central & Hudson River.*—Of the manual signaling 456.1 miles is "controlled"; this includes 156.2 double track, and 299.9 four-track.

24. *New York, New Haven & Hartford.*—Of the manual signaling 229 miles is manual controlled; some two-track and some four-track.

25. *New York, Ontario & Western.*—The new work consists of automatic signals, all for double track line.

26. *Pennsylvania.*—The item of 266.3 miles manual signaling includes 47.4 miles of three-track line.

27. *Philadelphia & Reading.*—The item of 28.5 miles under four-track includes some three-track line. The proposed new work, which will consist of Hall automatic disk signals, will include 3.3 miles of double track on the Philadelphia division; 12.6 miles on the Shamokin division; 41.1 miles on the Harrisburg division, and 17 miles on the Reading division; and 7.2 miles of double track and 5.8 miles three-track or four-track on the New York division.

28. *Pittsburg & Lake Erie.*—The 30.6 miles of automatic signals entered under four-track includes some three-track line.

29. *Southern.*—The short length of automatic signaling now in use on this road is in Atlanta, Ga. Of the new signaling proposed for the present year 106 miles will be automatic, as follows: Danville to Pelham, nine miles; Greensboro to High Point, 15 miles; Spencer to Linwood, nine miles; Armour to Howell, three miles; Austell to Roseland, 21 miles; Weems to Woodlawn, six miles;

MILES OF RAILROAD WORKED BY THE BLOCK SYSTEM, JANUARY 1, 1906.[1]

	Automatic			Manual				
	Single track.	Double track.	Four track.[2]	Single track.	Double track.	Four track.[2]	Total.	Proposed.
Alabama Great Southern.[3]	..	..	..	..	..	..	..	27
Atchison, Topeka & Santa Fe.[4]	91.0	45.0	..	1,147.1	68.0	..	1,351.1	60
Atlanta & West Point—jointly with Cent. of Ga.	—	—	—	—	6.0	—	6.0	—
Atlantic City (see Philadelphia & Reading)	..	..	..	..	..	..	..	..
Atlantic Coast Line	..	..	..	275.7	68.6	..	344.3	138
Baltimore & Ohio.[5]	3.8	104.1	..	192.8	465.5	70.8	837.0	—
Baltimore & Ohio Southwestern	..	..	..	..	31.6	2.8	34.4	9
Bessemer & Lake Erie	..	..	..	130.1	52.7	..	182.8	0
Boston Elevated	—	8.8	—	—	—	—	8.8	—
Boston & Albany.[6]	0.5	151.9	16.0	..	8.0	..	176.4	6
Boston & Maine.[7]	2.5	101.5	2.2	..	111.7	..	217.9	26
Buffalo, Rochester & Pittsburg.[8]	—	—	—	430.6	74.7	—	505.3	—
Central of Georgia.[9]	..	..	..	54.0	15.0	..	69.0	..
Central of New Jersey	..	161.7	32.0	..	..	..	193.7	..
Chesapeake & Ohio.[10]	—	—	—	967.3	200.4	—	1,167.7	—
Chicago & Alton.[11]	292.3	110.6	..	678.1	97.1	..	1,178.1	..
Chicago, Burlington & Quincy	..	21.4	6.0	1,470.3	470.0	..	1,967.7	..
Chicago & Eastern Illinois	—	106.0	—	586.0	57.0	—	749.0	—
Chicago Great Western	..	5.0	..	320.0	5.0	..	330.0	..
Chicago, Milwaukee & St. Paul.[12]	6.0	30.5	..	2,157.5	355.7	..	2,549.7	28
Do. for pass. trains and part time for freights	—	—	—	4,320.3	—	—	4,320.3	—
Chicago & North-Western	..	304.5	..	3,018.1	486.6	..	3,809.2	Some.
Chicago Terminal Transfer	0.6	5.0	..	..	..	..	5.6	..
Chicago, Rock Island & Pacific	—	15.6	—	1,521.0	—	—	1,536.6	—
Chicago & Western Indiana	..	..	..	..	19.8	..	19.8	7
Chicago, St. Paul, Minneapolis & Omaha	3.5	1.1	..	643.7	20.2	..	668.5	..
Cincinnati, Hamilton & Dayton	—	—	—	73.0	28.0	—	101.0	—
Cincinnati, New Orleans & Texas Pacific	304.5	24.7	..	6.0	..	..	335.2	..
Cleveland, Cincinnati, Chicago & St. Louis	..	..	..	607.4	245.2	..	852.6	27
Delaware & Hudson.[13]	73.1	44.5	—	—	—	—	117.6	85
Delaware, Lackawanna & Western.[14]	3.0	390.7	4.1	..	..	..	397.8	66
Erie.[15]	..	..	..	823.1	572.2	12.0	1,407.3	86
Grand Trunk (Portland Line)[16]	—	—	—	197.9	—	—	197.9	—
Hocking Valley	..	..	..	46.0	..	..	46.0	15
Illinois Central.[17]	6.0	210.0	14.0	636.0	..	..	866.0	123
Interborough Rapid Transit Co. (New York)[18]	2.4	11.1	—	—	—	—	13.5	—
Kentucky & Indiana Bridge & Railroad Co.	..	..	..	8.0	2.8	..	10.8	..
Lake Shore & Michigan Southern.[19]	..	43.0	51.0	..	401.0	45.2	540.2	456[2]
Lehigh Valley	35.7	443.5	27.8	597.9	69.6	—	1,174.5	—
Long Island	..	52.0	..	..	33.0	..	85.0	..
Louisville & Nashville.[20]	..	..	..	..	..	..	..	..
Maine Central	—	—	—	15.0	—	—	15.0	—
Michigan Central.[21]	3.0	465.0	..	113.0	..	..	581.0	95
Missouri Pacific	72.0	19.0	..	..	..	..	91.0	..
Mobile & Ohio	4.2	—	—	25.0	—	—	29.2	—
Nashville, Chattanooga & St. Louis.[22]	..	..	..	47.9	5.6	..	53.5	45
New York Central & Hudson River.[23]	..	106.4	12.5	1,529.9	508.8	299.9	2,457.5	30
New York, New Haven & Hartford.[24]	25.0	228.2	—	195.8	168.9	70.6	688.5	—
New York, Ontario & Western.[25]	22.0	67.0	..	..	..	..	89.0	17
New York, Susquehanna & Western	..	..	..	1.4	22.2	..	23.6	..
New York & Long Branch	—	37.0	—	—	—	—	37.0	—
Norfolk & Western	12.0	..	..	1,030.7	131.7	..	1,174.4	..
Norfolk & Western, passenger trains only	..	..	..	198.0	..	..	198.0	..
Northern Central (included in Penn. R. R.)	—	—	—	—	—	—	—	—
Northern Pacific	..	15.2	..	1,037.3	..	..	1,052.5	..
Ohio River Bridge (Louisville)	..	..	..	1.5	3.2	..	4.7	..
Oregon Short Line	31.0	—	—	—	—	—	31.0	43
Oregon Railroad & Navigation Co.	111.5	..	..	..	..	..	111.5	104
Pennsylvania.[26]	0.5	98.8	211.5	588.6	809.9	266.3	1,975.6	..
Pennsylvania, West of Pittsburg	—	10.0	29.0	1,106.0	996.0	—	2,141.0	—
Peoria & Pekin Union	..	1.0	..	..	5.4	..	6.4	..
Pere Marquette	..	..	..	..	..	..	..	..
Philadelphia & Reading.[27]	23.9	320.7	28.5	228.7	143.9	—	745.7	87
Phila., Balt. & Wash. (included in Penn. R. R.)	..	..	..	..	..	..	..	..
Pittsburg & Lake Erie.[28]	..	106.8	30.6	49.6	3.7	..	190.7	..
Rich., Fredksbg & Pot. (includg. Wash. So.)	—	—	—	32.0	88.5	—	120.5	—
San Pedro, Los Angeles & Pacific	..	2.0	..	..	..	..	2.0	..
Seaboard Air Line	..	..	..	155.0	..	..	155.0	..
South Side Elevated, Chicago	—	8.7	—	—	—	—	8.7	—
Southern Railway.[29]	..	2.0	..	952.9	83.8	..	1,038.7	534
Southern Railway, passenger trains only	..	..	..	6,438.3	..	..	6,438.3	..
Southern Pacific.[30]	486.7	—	—	120.0	—	—	606.7	252
Southern Pacific, Texas and Louisiana Lines	26.5	..	..	..	..	..	26.5	..
St. Louis & San Francisco.[31]	6.5	4.0	..	303.6	27.7	..	341.8	47
Staten Island Rapid Transit	—	8.7	—	—	—	—	8.7	—
Terminal R. R. Association, St. Louis	..	14.4	..	..	4.7	..	19.1	..
Union Pacific	131.1	45.5	..	..	..	..	176.6	186
Vandalia	—	—	—	241.0	—	—	241.0	—
Wabash	..	..	..	992.3	58.2	..	1,050.5	—
West Jersey & Seashore (included in Penn. R.R.)	..	..	..	..	..	..	..	..
Wisconsin Central	—	—	—	—	4.5	—	4.5	—
Yazoo & Mississippi Valley	..	..	..	15.0	..	..	15.0	..
Total	1,780.8	3,952.6	465.2	36,326.4	7,032.1	767.6	50,324.7	2,599

[1] The reference numbers in the table indicate numbered paragraphs in the accompanying text.
[2] The columns headed "Four track," include some three-track mileage, and in one case (Illinois Central, automatic), some six-track and eight-track.

Knoxville to Morristown, 42 miles, all double track; and a short piece of single track at Spartanburg.

The manual block signaling now in operation aggregates 1,037 miles, of which about 84 miles is double track. The principal lines are from Alexandria, Va., to Atlanta, Ga.; Austell to Roseland; Morristown to Chattanooga; Austell to Rome, and 158 miles on the St. Louis-Louisville line. It will be noted that some of the proposed new automatic signaling is to take the place of some of the manual signals. It is proposed, also, to establish about 428 miles of new manual signaling, as follows, all single track:

Macon to Roseland	84.4 miles.
Austell to Weems	140.0 "
Rome to Ooltewah	64.7 "
Morristown to Asheville	87.4 "
North Birmingham to Corona	51.2 "
Total	427.7 miles.

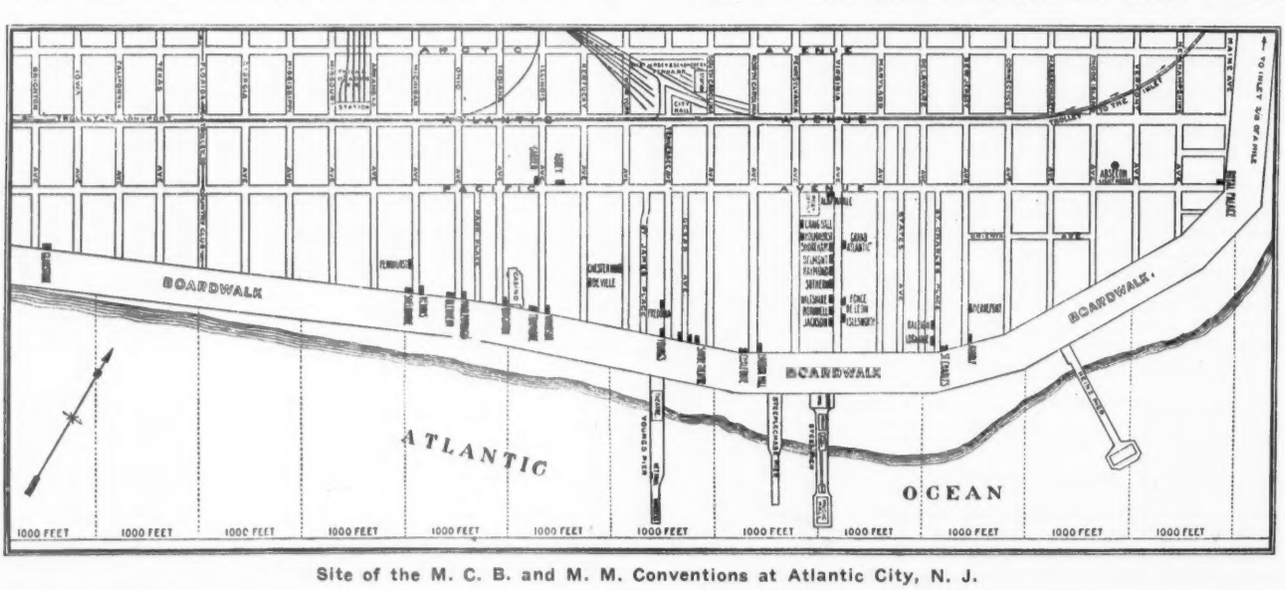
All of the foregoing is represented in the figures shown in the first item in the table under the Southern Railway. The second item in the table, representing lines on which the spacing of trains is managed by the train despatchers, covers 6,092 miles on the Southern Railway and its controlled lines south and east of Louisville, and 347 miles on the Louisville-St. Louis lines.

30. *Southern Pacific.*—The total mileage of road signaled on the Union Pacific, the Southern Pacific and the Oregon lines controlled by these companies, aggregates 1,045 miles, and the new work proposed for 1906 (all automatic and nearly all single track) aggregates 664 miles of road. Of the automatic signaling put in use during the past year 54 miles, between Benicia and Truckee, takes the place of the telegraph block system heretofore used; and of the manual signals now in use 97 miles represents the electric train staff (a manual controlled apparatus) which has been installed in place of the telegraph block system. This also is on the division lying between the places just named. This leaves only 23 miles of the simple telegraph block system in use.

31. *St. Louis & San Francisco.*—The new work proposed on this road this year consists of automatic signals for one mile of double track and for three miles of single track; and the telegraph block system on 43 miles single track.

1906 M. C. B. and M. M. Conventions.

At the annual conventions to be held at Atlantic City, N. J., in June, the headquarters for meetings, exhibits and social functions will be the steel pier. Meetings will be held in the concert hall at the entrance and exhibits will be arranged along the entire east side of the structure; the total exhibit space amounts to 40,000 sq. ft., which provides for exhibits on a larger scale than ever before. Steam and electric power is to be furnished to exhibitors and paid for by them, but there will be no charge for exhibit space aside from the membership contribution of $35. The installation of exhibits may be begun on June 1; they must be completed by June 13, and removed before June 27. The accompanying cut shows the location of the different hotels, whose rates for those who attend the convention were published in the *Railroad Gazette* of December 15.



Site of the M. C. B. and M. M. Conventions at Atlantic City, N. J.

The first passenger train passed through the Simplon tunnel on January 25.

More About Armour's Refrigerator Business.*

The profits of the private car business cannot, with any fairness, be judged on a harvest-time basis—which the critics of the enterprise seem to insist upon doing. This is a business of lean years as well as fat years. Then the period of profitable and established operation should be averaged with the years in which the business was in a struggling and pioneer stage. Modern inventive genius may render practically useless and obsolete an equipment now representing an investment of millions of dollars, and this possibility is by no means so remote that good business prudence would not take it into account.

I deny that the profits of the private car line business and the packing business are extortionate. I have no desire to deny that both do pay a profit. Had I put my holdings, at the time I came into them, into railroads, national banks and other enterprises I should have made more money, made it with less trouble and been subjected to less attack. I sincerely believe I should have been of far less service in the industrial development of this country than I have been in the private car line and the packing business. I am not posing as a philanthropist or asking for any credit on that or any kindred score. Just common-sense selfishness and the regard for the well-being of humanity that the ordinary decent citizen has are all the motives that I lay claim to in the conduct of my business. Thousands of men have been enabled to make independent fortunes by the activities of the private car. The whole people enjoy comforts and luxuries otherwise impossible.

The charge for refrigeration service also covers maintenance, repair and replacement of the tools employed in the business—the ice making plants, ice houses, icing stations both in the fruit-growing sections and throughout the country along the routes from the growing locality to the market, repair shops and the cars themselves. These cars cost from $1,000 to $1,200 each—a third and sometimes half more than the ordinary box car. They are easily damaged. Almost every car needs more or less repairs every trip. They wear out more quickly than ordinary freight cars, and are more easily put out of service from many causes. If loaded with anything that leaves an odor—drugs, kerosene oil, etc., as happens often—the car is likely to be made useless for further service in the fruit-carrying trade.

California is a district in which a field organization must be maintained practically the year round. We have to maintain our own car-repair shops and icing stations, and when fruit is moving a band of more than 50 men as inspectors, supervisors, etc., are up and down through the district superintending the loading and icing, enforcing prompt movement of cars and pushing all details of the work. We have a force of more than 200 men in California during the season.

Before the fruit-shipping season opens, cars enough to handle the crop must be assembled at points convenient to the shipping stations. More than half of them go west empty and are subject to many delays; some may be loaded with clean package freight. These will be from 50 to 30 days en route from Chicago to Los Angeles, and unloading there may be delayed. During all this period, before a pound of fruit is loaded, the car line company must keep track of these cars, trace them from point to point,

*Extracts from an article by J. Ogden Armour, in *The Saturday Evening Post*, Philadelphia. A former article was abstracted in the *Railroad Gazette* of Jan. 19, page 64.

and know whether they are empty and available for immediate use or loaded and unavailable. Finally, the car we are following lands at our Los Angeles shop, where they thoroughly overhaul the car, put new padding on doors and hatch plugs, clean and repair tank pans, drains and drain traps. After the car is thoroughly overhauled tanks are filled with about 10,000 pounds of ice. Wonderful things are grown in California, but no one, not even the wonderful Mr. Burbank, has been able to grow a natural crop of ice in Southern California. For Northern California we must haul the ice from the mountains at heavy expense for freight and shrinkage. We also buy enormous quantities of manufactured ice. In 1905 we bought more than 120,000 tons of ice in California.

When the car is iced it is sent out to the loading point and there is a further heavy shrinkage of ice in the tanks. The car may have been standing for days in a railroad yard. The fruit loaded into it and the packages containing that fruit are also hot—soaked, as it were, in California sunshine. The car and its load must be brought down to a low temperature. Every board, every nail, every orange, every piece of wood exudes heat. Much ice must be melted, obviously, to bring the hot car and its load down to a low temperature.

The car, when loaded, is sent back to Los Angeles (to Bakersfield if going east by the northern route), its ice tanks are refilled, it is thoroughly inspected again by car line men and is started on its journey east. If it takes the southern route it stops first at Tucson, Arizona, to be re-iced under the supervision of a car line agent, who not only sees that the tanks are properly filled to capacity, but also makes a personal inspection of all drain pipes, etc. The car then passes on to El Paso, where car line agents are waiting for it. It is again thoroughly re-iced and inspected and sent on to Fort Worth, where another agent is in waiting to perform the same service. This process is repeated seven or eight times more before the car reaches Boston—Kansas City, Davenport, Chicago, Galion, Hornellsville, and East Deerfield. The same facilities are maintained on all the various routes. When the car leaves Los Angeles, the car number, its condition and digest of the waybill are all taken by a car line inspector and Tucson is notified that the car is on the way to him. This checking and notification of stations ahead continues without break until the car reaches destination, under the eye of the car line organization every hour, and is kept moving. When the car finally reaches Boston a car line inspector notes its condition, sees it opened, inspects condition of its load and reports all details to the head office. Nobody in Boston ventures to report to the shipper in California that a car handled and watched as described has "arrived in bad condition." The item of repairs is a heavy one. During a short, rush season, as in handling Michigan and Georgia peaches, time does not permit sending cars to the shops, but car repairers have to be sent into the field. In Michigan last fall three car-repair superintendents were maintained in the field, and each had from five to ten men with him, at the expense of the car line. In view of these facts I submit that a tariff rate of $77.50 Los Angeles to Boston on the car outlined above is as low as good and proper service will permit. It was only a few years ago that this same rate was $95, but we were able to reduce our operating expenses and gave the shippers the benefit of it. Just as soon as conditions will warrant it the rate will again be reduced.

The private car line service also enables the shipper to control the destination of his product and to avoid glutted markets. A shipper starts a car of peaches from Grand Rapids to Boston. After the car has left he learns that the Boston market is full. At any place along the route of that car—Detroit, Buffalo, Albany—he can change its destination to New York, Providence, Philadelphia, Baltimore, or any other point that promises a better market. In 1904, during the one month of July, more than 500 cars of Georgia peaches, an average of more than 16 a day, were caught at Cincinnati alone, diverted from their original destination and sent to other places that promised better results. In 1901 a certain railroad touching Benton Harbor, Michigan, was undertaking to furnish refrigeration service at cost of ice. Private cars were operating on another road reaching that same point. Mr. Roland Morrell, of Benton Harbor, one of the best fruit growers in America, had 25 cars of choice peaches to ship. He was within three miles of a loading station on the road which provided refrigeration at cost of ice. To reach a loading station of the private car lines his peaches had to be hauled five miles, part of the way uphill. Yet he turned his back upon the alleged low price service, made the five-mile haul, shipped in private cars and paid the tariff of $55 a car to Boston rather than take a chance on railroad refrigeration service. Asked why he paid this "unnecessary" charge, he said: "I raise peaches to sell. I am not raising peaches to be spoiled in transit and paid for by the railroad." The Fennville *Herald*, which is the organ of one of Michigan's heaviest peach-shipping points, a paper that has never shown friendliness toward private car lines, said that had it not been for the good work done by the Armour private car lines in furnishing plenty of first class cars and looking after the prompt icing of same in transit that section would have been ruined the last season.

Almost every fruit and vegetable growing district in this country is a living witness to the pioneering work and the efficiency of the private car line. These lines have served both to develop new fields and to widen the market of the fields already in existence. There are practically no reliable statistics to be had anywhere in the country in relation to the fruit industry save those gathered by the private car lines. Up to ten years ago practically no fruit was shipped out of Michigan under refrigeration. Practically all of the crop was dumped into Chicago by boat and by ventilated cars. The Chicago market was uniformly low in consequence, and Chicago commission men made handsome profits by re-shipping Michigan peaches to other points, even back into Michigan.

The private car line began to investigate the Michigan field some years ago. Eastern fruit dealers were told to send their buyers into that district, and, if they found that the results did not justify the effort, the car lines would pay the expense. This practice of sending buyers to the door of the grower—buyers who buy for cash and do not require the grower to ship on commission—has spread to all parts of the country. The private car lines give a grower a market at his own door.

Since 1889 the fruit and vegetable industry in California has grown practically ten times in volume; and financially it is in better condition than at any previous time in its history. California shipped, in 1905, 30,000 cars of lemons and oranges at an increase in profit over 1904 of more than $100 per car. Right now 200 cars a day are coming out of that state. The orange and lemon industry of California would not have been developed without the private car. A few years ago head lettuce was a rarity in northern markets. The private car line has developed this trade and has made many Florida farmers rich thereby. New York alone now absorbs 40 to 50 cars a day during the winter months.

A car line agent interested strawberry growers around Nashville, in 1903, to ship eight or ten cars as an experiment. Shipments rose to 60 cars in 1905. Humboldt, Tennessee, used to send out about 50 cars of tomatoes a season, six or seven years ago. The tomatoes had to be shipped green and ripened in the commission man's storeroom, which, of course, impaired the quality. Humboldt now ships in a season 500 cars of tomatoes that are allowed to ripen on the vines and therefore bring a much better price. The new prune plum district of Idaho has been developed entirely by the private car line missionary work and within a very few years. The far northwest now sends to market from 2,000 to 3,000 cars a year. Other important new districts are being similarly developed in northeast Texas, in Utah, Colorado, Arizona, Arkansas and Missouri.

The principal fruit-growing districts of the country in 1899 shipped under refrigeration only 9,164 cars; the same districts in 1905 shipped 42,982 cars. In particular districts during this period shipments have been multiplied to 10 and even 20 times over so far as the Armour lines alone are concerned. Michigan peach lands undeveloped are worth only from six to ten dollars; with bearing peach orchards they command $200 to $300 an acre. Florida lands that were almost worthless are now yielding to growers of head lettuce and other early vegetables an annual return of $500 to $1,000 to an acre. There are districts in Georgia where lands bought for one dollar an acre are now worth ,with peach orchards in bearing, $300 an acre. California orange and lemon bearing lands are worth $1,000 an acre.

Mr. C. A. Sessions, of Shelby, Mich., says "buyers come to us—to our very doors—because they know this service will deliver in good condition what they buy. In Chicago the market is almost always glutted with fruit that goes across the lake by boat. Chicago commission men work to keep it glutted. We have had commission-house solicitors running up and down our streets here soliciting shipments, when they knew Chicago was already overstocked. That was to get our fancy peaches at a low, glutted market price, so they could be reshipped to other points at a profit."

Mr. J. R. Wylie, of Shelby, says: "This last summer I shipped plums to two points, Chicago and Dayton, Ohio. The same kind of plums went to both places. My Chicago shipment averaged 80 cents a bushel net; my Dayton shipment averaged $1.45 a bushel net."

Last fall two large eastern fruit houses discovered that quantities of Michigan peaches were being dumped into Chicago by boat and by rail from points not covered by the private car service. They went on the open market in South Water street, and there bought Michigan peaches for shipment east at lower prices than they would have had to pay over in Michigan at points served by private cars. More than 400 cars were thus handled. . . . It may be a fact that in some isolated instances local passenger trains have been sidetracked to let pass a through freight containing private cars. I do not know of such an instance, but it is possible. It is not a fact that this sort of occurrence is a part of the system of our operation or a logical result of it.

Some critics of the private car system are at great pains to create the impression that the mileage which the railroads pay the owners of the private cars as rental is so large that there should

be no charge at all to the shipper for refrigeration. Mr. J. S. Leeds, of the Santa Fé, made this statement under oath: "The fact of the business is, the mileage that a car earns in the California fruit business will not maintain it. It will not pay the interest on its cost and pay for administration expenses or the organization and replacement. If this is true the refrigeration of these commodities should pay a profit and should also pay its share of the maintenance and the expense of the operation of the line."

Freight Rates.—Sensational periodicals have indulged in much and violent comment regarding the freight rates on dressed meats and other packing-house products as compared with the rates on live cattle. This matter was thoroughly tried out in the famous "Cattle Case" heard by Judge Bethea in the United States Circuit Court sitting at Chicago. In his opinion, filed Dec. 2, 1905, about a month ago, Judge Bethea made the following findings of facts:

"That the live-stock rates are reasonable in themselves; these rates are equal to or less than the rates on dressed meats and packing-house products between the same points.

"That the cost of carrying live stock is greater than that of carrying dressed meats and packing-house products. The evidence shows that the defendant railroad companies pay out a much larger amount in damages for losses arising from the carriage of live stock than they do for losses arising from the carriage of dressed meats and packing-house products, in proportion to the value of the products carried, and more in damages per car regardless of the value. This makes the risk of carriage greater for live stock.

"That the rates for carrying packers' products and dressed meats were remunerative."

Green Lights for "Proceed" at Night.*

In connection with the inquiries which we have made concerning the extension of block signaling during the past year, those roads which use green for the all-clear indication at night in fixed signals or which intend to do so, have been asked certain questions about their practice, and the answers to these questions are summarized below. Roads named without explanation use green for proceed and yellow for caution.

Atchison, Topeka & Santa Fe.—Road is being gradually equipped so as to use green for the night proceed indication in fixed signals; yellow for the caution indication. It is expected to have the changes all made within the next 12 months. Yellow is to be used as a slow signal by track men. The yellow is a dark hue.

Baltimore & Ohio.—Green is used for proceed in fixed signals on the Baltimore & Ohio Southwestern only. For distant signals, yellow, medium hue. Yellow used also for portable caution signals. On the Philadelphia division purple lights are to be introduced for the stop indication in dwarf signals.

Bessemer & Lake Erie.—Green for proceed. Yellow for caution; hue dark. Yellow and green are used on all siding switches, normal color green, yellow indicating open switch. This to distinguish siding switches from main track switches. Same colors are used on derailing switches, normal color being yellow indicating open switch. Yellow is also used in place of green indicating caution for minor purposes, such as bi-colored green and yellow flag for flag stop, yellow for trackmen, etc.

In addition to the uses above mentioned, yellow is used on the home block semaphore mast, supplementary to the home block indication when home block signal cannot be cleared to indicate that a clearance form, with respect to train orders and the block to be entered, releasing an approaching train from the signal, is to be handed on by the operator by means of delivery hoops; also for a like delivery of a 19 order conferring right or extending right previously restricted by train order, to the end that the approaching train shall not be unnecessarily stopped at points where right is not by time-table or train order restricted. Green and red are used on all main track switches, normal green. Red indication on switch stand indicates open switch on main track.

Boston Elevated.

Boston & Maine.—Blue is used for stop in dwarf signals. In standard semaphores the casings, when renewed, are designed for two glasses, so that green can be used for proceed.

Canadian Northern.

Canadian Pacific.

Chicago & Alton.—Green and yellow (dark hue) have been used for several years with entire satisfaction.

Cincinnati, Hamilton & Dayton.—This road reports that green is *not* used for proceed.

Chicago & North-Western.—Green for proceed; a green light and a red light side by side, for caution.

Chicago, St. Paul, Minneapolis & Omaha.—Same as C. & N.-W.

Cleveland, Cincinnati, Chicago & St. Louis.

Colorado & Southern.

Delaware & Hudson.—The yellow is dark.

Delaware, Lackawanna & Western.—Kopp yellow is used. Purple is used for stop in some dwarf signals.

Erie.—Green and yellow used on Delaware division only. These colors are to be introduced on the New York division.

Illinois Central.—The yellow glasses are "medium to dark."

Interborough Rapid Transit Company.

Lake Shore & Michigan Southern.—Does not use green for proceed; does not use yellow for any purpose except on highway crossing gates. Purple is used for stop in dwarf signals.

Lehigh Valley.—This company intends to use green for proceed and yellow for caution but has not decided when to make the change. Purple is used for stop in dwarf signals.

Long Island.—Uses green and yellow; the yellow is dark. Purple is used for stop in dwarf signals which are situated between running tracks.

Michigan Central.—Green for clear and yellow for caution, adopted east of Detroit Dec. 15, 1905; west of Detroit about a month later.

Missouri, Kansas & Texas.

Missouri Pacific.

New York Central & Hudson River.—Green for clear and yellow for caution are to be adopted soon on the Harlem and the Hudson divisions. Yellow of a dark hue is preferred. It is intended to make the change in all lights used as signals; that is to say, in semaphores, disks and switchstands, and in marker lights on trains. Purple is used for stop in dwarf signals. This has been so used for some time, and has been satisfactory.

New York, New Haven & Hartford.—Besides its use in fixed signals the yellow light is used for slowboards.

Oregon Railroad & Navigation Company.

Oregon Short Line.

San Pedro, Los Angeles & Salt Lake.

Southern Pacific.

Terminal Railroad of St. Louis.

Tidewater Railway.—Road now under construction. Green will be used for clear; yellow for caution.

Union Pacific.—Besides its use in fixed signals, yellow is used for the trackmen's night slow signals. Nels yellow has been used, but a lighter hue will probably be adopted. Yellow flags are of a dark tint.

Texas.—In the state of Texas the State Railroad Commission requires the use of green for proceed at grade crossings of one railroad with another.

*In this article, the adverse indication of a distant signal is termed "caution." In describing the hue of yellow glasses, "Nels" yellow is classed as dark.

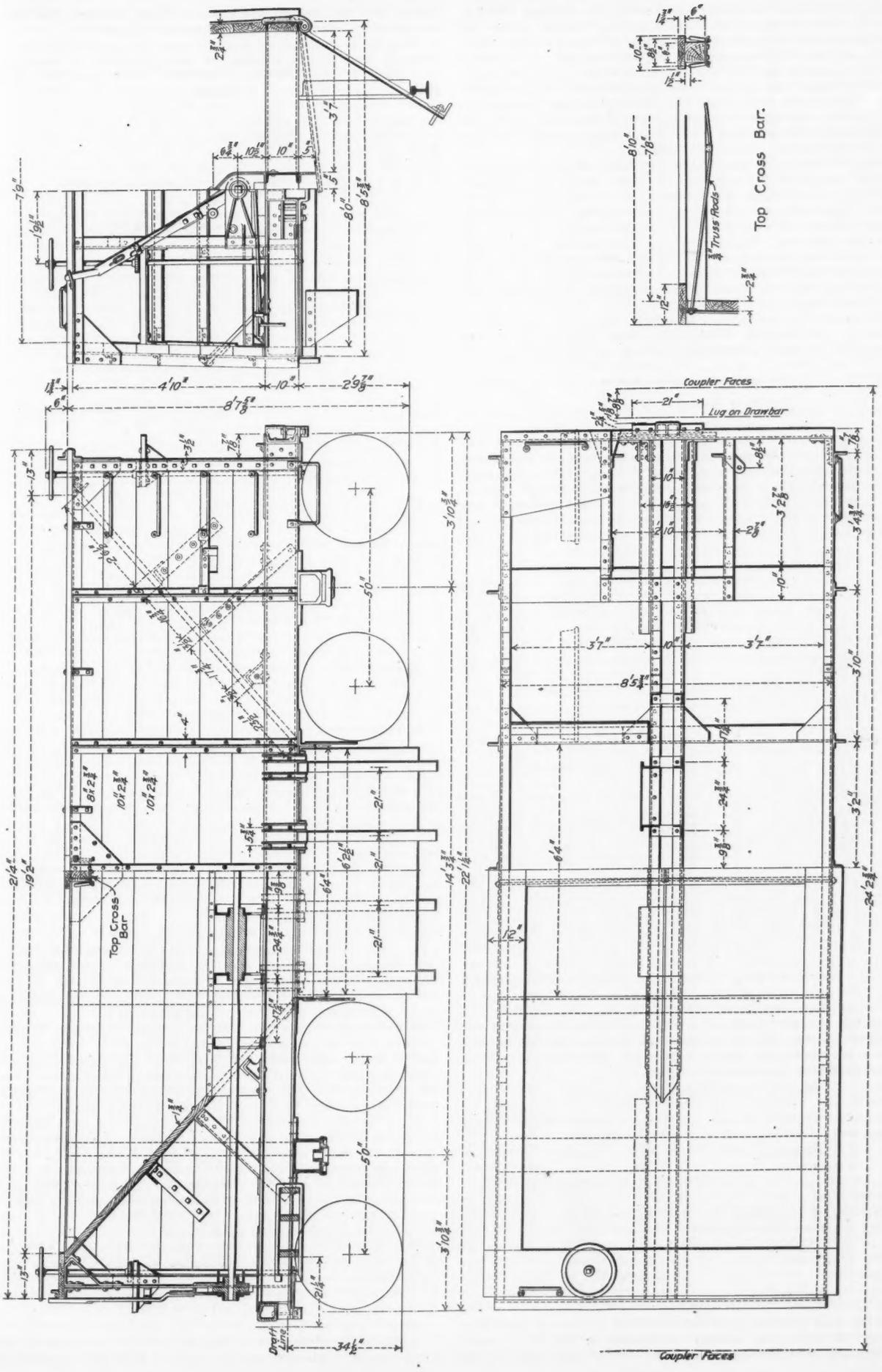
New Ore Cars for the Chicago & North-Western.

The Chicago & North-Western heretofore has used wooden ore cars having the usual side and end slope hopper, sides vertical above the hopper side slope, and doors swung transversely across the car. This design disclosed in service a number of objectionable features, one of the most serious of which was a frequent inability to discharge its load without assistance. If the ore was hauled any great distance it would pack down hard in the car with the result that often when the doors were lowered the principal mass of the load would not move until vigorous means had been employed to dislodge it. To overcome these objectionable features Mr. C. A. Schroyer, Superintendent of the Car Department, designed the car illustrated herewith. A single experimental car was built at the Chicago shops of the road last fall in order to give the design a thorough trial in service and develop any defects or undesirable features that might exist. After several months in service the car has proven most satisfactory and others will be built. Some changes in minor details only have been found necessary.

The new design is of steel construction with a wooden lining, wood being used in preference to steel to minimize difficulty from the ore adhering to the sides in freezing weather. To obtain the most advantageous condition for discharge of the load, the hopper side slope of the older design has been omitted, the entire side being straight. Also, the sides are given a slight inclination inward from the vertical, the car being 4 in. narrower at the top than at the bottom. The door opening has been increased in size, necessitating a somewhat greater wheelbase, although the total length of the car is the same as the old. It will be noted that this dimension on the drawing is given inside of the contact faces of the couplers. This is specified to insure a train of the cars centering properly over the pockets in the ore docks.

Each door opening is 6 ft. 4 in. long by 3 ft. 7 in. wide. The drop doors are hinged to the car sides and each is supported at its opposite or inner side by chains passing around winding drums mounted on a longitudinal shaft. The doors are raised by a lever and ratchet at the end of the shaft and car. They fall by gravity upon releasing the ratchet pawl. An important advantage in the side-swung doors is that in their lowered position they form the side slopes to the hopper, confining the ore between the rails.

The features embodied in this car to facilitate unloading enable



Chicago & North-Western Steel Frame 80,000-Lb. Ore Car.

a full load of ore to be discharged in from one to three minutes, depending on the kind and condition of the ore. Maple is used for the lining, the ore sliding better on this wood than on other kinds. Openings are provided between the side planks and the edges of these planks are beveled so that these openings extend obliquely downward. They were provided on one side only in the experimental car, the idea being that they might facilitate thawing out frozen ore with hot water and also facilitate unloading by the use of an unloading bar to loosen up the ore. It has been decided not to include this feature in the new cars.

Some differences of detail have been made in the revised design from which the new cars will be built. The chief change is at the ends in the bracing for the end slope. In the first car there are four braces secured at their lower ends to the side and center sills respectively. It was found that in service the surge of the load against the slope imposed stresses that caused a perceptible and permanent sag in each end of the car. The design was therefore modified by extending the wooden siding out to the end of the car, bolting the side braces to this siding and omitting the two center braces altogether.

The capacity of the cars is 80,000 lbs. They are mounted on steel trucks. On account of the large door opening there is a brake cylinder for each truck, operated from one triple valve.

Accident Bulletin No. 17.

The Interstate Commerce Commission has issued Accident Bulletin No. 17, giving the record of railroad accidents in the United States during the three months ending Sept. 30, 1905. The number of persons killed in train accidents was 272, and of injured, 3,455. The total number of casualties from train accidents and other causes was 17,439 (1,053 killed and 16,386 injured). These reports deal only with (*a*) passengers and (*b*) employees on duty.*

Table No. 1.—Casualties to Persons.

	Passengers—Classes a and b.		Class bb.		Employees		Total persons reported.	
	Kld.	Injrd.	Kld.	Injd.	Kld.	Injrd.	Killed.	Injrd.
Collisions	15	952	7	97	126	776	148	1,825
Derailments	16	677	5	76	88	491	109	1,244
Misc. train accidents	..	24	..	6	15	356	15	386
Total train accidents	31	1,653	12	179	229	1,623	272	3,455
Coupling or uncoupling	..	.....	..	..	74	819	74	819
While doing other work about trains, etc.	..	.....	..	..	45	3,821	45	3,821
Overhead bridges, structures at side of track, etc.	..	15	..	9	26	373	26	397
Falling from cars, engine, etc.	48	571	2	20	171	2,522	221	3,113
Other causes	20	665	9	57	386	4,059	415	4,781
T'l, other than trn accdts.	68	1,251	11	86	702	11,594	781	12,931
Total, all classes	99	2,904	23	265	931	13,217	1,053	16,386

*In Table No. 1 the passengers have been divided into classes, a, b, and bb. Class a includes all ordinary passengers; Class b includes passengers traveling on freight trains; Class bb includes persons (nor ordinary passengers on passenger or freight trains) who are customarily carried or allowed on trains under special arrangements or privileges, such as postal clerks and express passengers; conductors, porters, and other employees on Pullman cars; employees on private or special cars; newsboys, baggage solicitors, peddlers, live-stock tenders and men in charge of freight.

Nearly all of the totals in table No. 1 are larger than in the three months last preceding, and some are very much larger. These figures are doubtless in large measure a reflection of the very heavy traffic done by the principal railroads of the country during the busiest summer months. The number of passengers killed in train accidents, 43, is larger than in either of the two preceding quarters, yet it is far below the disastrous quarter which included the same three months of 1904, when 228 passengers were killed in collisions and derailments. The two most notable accidents in the present report are a collision killing 12 persons and a derailment killing 15. In the table of causes given below these accidents are numbered, respectively, 5 and 10. Flagrant misconduct and negligence characterized both cases.

Table No. 2.—Collisions and Derailments.

	No.	Loss.	Persons Killed.	Injured.
Collisions, rear	338	$388,873	36	476
" butting	225	412,956	68	709
" trains separating	216	91,404	4	74
" miscellaneous	826	391,428	40	566
Total	1,605	$1,284,661	148	1,825
Derailments:				
Due to defects of roadway, etc.	284	$159,058	12	408
" defects of equipment	733	534,704	11	234
" negligence of trainmen, etc.	115	95,395	24	170
" unforeseen obstructions, etc.	74	88,482	16	100
" malicious obstructions, etc.	20	55,026	8	43
" other causes	304	323,582	38	289
Total	1,530	$1,256,247	109	1,244
Total, collisions and derailments	3,135	$2,540,908	257	3,069

In the long table is given the usual list of class A train accidents—all in which the damage is reported at $10,000 or over; notable cases in which passengers are killed, and those doing damage less than $10,000 and down to $2,000, wherever the circumstances or the cause may be of particular interest:

Causes of Thirty-one Prominent Train Accidents (*Class A*).

[Note.—R. stands for rear collision; B., butting collision; M., miscellaneous collisions; D., derailment; P., passenger trains; F., freight and miscellaneous trains.]

Item.	Class.	Kind of train.	Killed.	Injured.	Damage, to engine, cars and roadway.	Cause.
						Collisions.
1	R	F. & F.	1	0	$2,375	Failure of torpedoes to explode.
2	R	F. & F.	3	2	2,700	Occurred 2 a. m.; engineman of 13 years' experience, on duty 12½ hours, ran past two automatic block signals and a flagman; this engineman was killed.
3	B	P. & F.	1	14	3,800	Watch wrong; conductor and engineman failed to compare watches, as required by rule.
4	M	P. & F.	0	4	4,350	Occurred at 8 p.m.; switch turned under train. (See note in text below.)
5	B	P. & F.	12	54	5,584	Occurred, 1 a. m.; westbound freight train encroached on time of eastbound passenger train. (See note in text below.)
6	B	P. & F.	5	10	7,800	Pay-car train encroached on time of regular passenger train; pilot in charge of pay-car, who was trainmaster of division, miscalculated time available for reaching the next station, by reason of failure of his watch, which had stopped.
7	..	P. & P.	3	21	8,000	Northbound train wrongfully ran into a cross-over track; switch, which had been spiked and ordered kept closed, was unfastened by a track repair man; this employee, who was experienced, decamped.
8	B	P. & P.	0	59	8,500	Train approached meeting station with speed not under control; engineman had inadvertently shut off the connection to air brake reservoir, and had neglected to test air brakes 2 miles before reaching the station, according to rule.
9	B	P. & F.	0	20	8,600	Despatcher gave order, "No. 1 will run 2 hours late"; should have said, "second No. 1"; did not send order to all interested stations at once.
10	B	F. & F.	1	3	11,200	Operator failed to deliver order to eastbound freight.
11	R	P. & P.	6	35	12,000	Engineman disregarded stop signal. (See note in text below.)
12	M	F. & F.	3	3	12,200	Westbound freight switching at a way-station, crossed over to eastbound track without first flagging eastbound trains.
13	B	P. & P.	2	83	13,200	Engineman misread time or was deceived by defective watch; watch lost in wreck; engineman being experienced and reliable, conductor did not carefully calculate time to meeting point.
14	B	P. & F.	3	8	14,500	Passenger train started from station in advance of time named in wait order, freight failed to clear time of passenger 10 minutes; passenger conductor, brakeman and fireman left all care to engineman, who forgot order.
15	B	F. & F.	1	6	14,923	Mistake in copying train order. (See note in text below.)
16	B	F. & F.	4	3	15,000	Signalmen, each 6 months' experience, admitted opposing freight trains into "controlled manual" block section on single track. (See note in text below.)
17	B	P. & F.	2	13	18,000	Freight encroached 2 mins. on time of passenger train; men in charge (2 years' experience) "took chances."
18	M	P. & F.	2	25	21,200	Engineman of empty engine (1 a. m.) ran over misplaced switch and through cross-over track; it was his duty to see that switch was set right before passing it.
19	R	F. & P.	3	53	21,865	Freight approached station on descending grade with speed not under proper control; passenger train standing at station had insufficient tail lights.
		Total....	52	416	$205,797	
						Derailments.
1	D	F.	1	6	$240	One passenger killed, 5 passengers injured; train consisted of engine and caboose, engine running backward; tender was the first vehicle to jump the track.
2	D	F.	0	39	3,000	Unexplained; large box car loaded with staves and heading was probably unfit to run around curve.
3	D	P.	0	15	5,000	Passenger car overturned by turning of switch beneath moving train. (See note in text below.)
4	D	P.	1	2	5,000	Misplaced switch; speed 40 miles per hour; switch was undergoing alteration and was not suitably signaled. There was no rule requiring reduction of the speed of trains running past the point where alterations were in progress.
5	D	P.	0	4	5,300	Passenger train derailed by striking street car at highway crossing; conductor of street car failed to give required flag signal (3 fatal and 7 non-fatal injuries in street car).
6	D	F.	1	2	6,150	Switch maliciously misplaced.
7	D	F.	2	2	6,450	Runaway on 2 per cent. grade; nonautomatic air brakes inoperative because coupling between engine and tender had accidentally parted.
8	D	F.	1	2	11,600	Excessive speed.
9	D	P.	0	18	13,300	Broken truck.
10	D	P.	15	28	32,000	Open draw. (See note in text below.)
11	D	P.	2	20	35,469	Switch maliciously misplaced; 4 a. m.
12	D	P.	0	20	39,278	Unexplained; supposed that empty baggage car was lifted by sudden application of air brakes; track in first-class condition; wreck burnt up by fire which started from an explosion of acetyiene.
		Total....	23	158	$162,787	

Collision No. 4 appears to have been due to a combination of an inexperienced towerman and the lack of a suitable detector bar.

The collision occurred at 8 p.m., and though three cars were overturned the personal injuries were slight. A passenger train, running at 40 miles an hour, was diverted by the turning of a switch while one of the passenger cars was passing over it, with the effect that the cars ran against a locomotive on the adjoining main track. The towerman (23 years old) had been in service only nine days. The detector bar, designed to prevent the throwing of a switch while a train or car is passing over it, was only 25 ft. long—not long enough to reach from the rear wheels of a front truck of a car to the leading wheels of the rear truck of the same car. This made it possible for the towerman to throw the switch after the passage of the leading truck and before the passage of the other one.

Collision No. 5, killing 12 and injuring 54 persons, nearly all of whom were passengers, occurred in the middle of the night, and one of the trains was running at nearly full speed. The men in charge of the freight train (westbound) were grossly negligent in occupying the main track on the time of the eastbound passenger train. The freight train had run a few hundred feet beyond the side track at which it should have stopped and have cleared the track for the passenger train. The explanation offered by the engineman, is that he made a mistake in reading the time at L., the last station that he had passed. He says that he read "11.33" when the true time was 12.33. This man is 46 years old and had been in the service as engineman on the same road for 19 years. The company gives him a good record. He had been on duty about 13 hours at the time of the collision and had been off duty 20 hours and 25 minutes immediately preceding this trip. In the case of a man who, at midnight, has been on duty 13 hours, the query naturally arises whether he was not asleep or dozing. This engineman denies that such was the case, and there is no evidence to contradict his assertion.

The conductor is held at fault for not having had a complete understanding with the engineman at L. as to the point at which they should meet the passenger train and for not making reasonable effort to stop his train before encroaching upon the time of the passenger. About two miles before reaching the point of collision this conductor left the caboose and started over the tops of the cars to go to the forward end. He had gone about two-thirds of the way over the train when it reached the point where the engineman should have shut off steam and applied the air-brakes, but instead of at once stopping the train, as might have been done by applying the air-brakes on any car, the conductor continued on to the engine; but by the time he had reached there it was too late to prevent the collision. The fireman and the front brakeman were also held accountable because, knowing that their train was on the time of the passenger train, they took no measures either to caution the engineman or to stop the train. The rear brakeman was also held blameworthy for not acting promptly in the emergency. The air-brakes were in operation on the whole of the train except the caboose and one platform car at the rear. By going over this platform car the brakeman could have applied the brakes.

Collision No. 11 occurred in a yard on a four-track line completely signaled, the semaphore signals being on bridges above the tracks. An accommodation train standing at the station was run into by an express train which should have passed on another main track, but which, in disregard of a stop signal, was run through a crossover track. The engineman appears to have allowed his attention to be drawn away from the signal by the movements of the accommodation train, which he was watching.

Collision No. 15, occurring at 1 a.m., was due to copying "79" instead of "59" in a despatcher's order. The receiving operator claims that after writing "79" he repeated the figures to the despatcher; but four other operators, listening, testify that in repeating the order he sent "59." This operator, with six months' experience as an operator and six months before that as a student, neglected to watch the wording of the same order when it was repeated, on the same wire, by the operators at other stations. He seems to have trusted to his memory, not writing down the words and figures of the message in successive order as they were transmitted.

Collision No. 16, occurring about 3 a.m. and causing the death of one engineman, one fireman, and two brakemen, was due to very irregular and improper action on the part of two block-signal men, each of about six months' experience, and the negligence of an engineman of seven years' experience. Each of the two trains had identical orders from the despatcher to meet at B, and the collision occurred a short distance south of B (between B and C), the southbound train having passed the meeting station without stopping. The operator at B gave to the train (wrongfully) a clear signal and the engineman says that this action of the operator deceived him and caused him to forget the meeting order which was in his possession. The conductor and a brakeman noticed his error and endeavored to apply the air-brakes, but were not able to do so in time to prevent the collision. This was a train of 33 cars, of which 25 were air-braked.

The operator gave the clear signal because of some neglect, not clearly explained, in the preliminary operations which had taken place between his office and the office at C. The block-signal instruments at the two stations are connected electrically, so that either station wishing to permit a train to proceed toward the other must first communicate with the other station. The operator at C had communicated with B, and B had taken the necessary action to permit C to forward the northbound train (which was in collision); and C asserts that eight minutes after this train had departed he received a signal from B that the northbound train had arrived and cleared the block section, whereupon he permitted B to give the clear signal for the southbound train. These two block-signal stations are connected by telephone, as well as by the wires which connect the signal-indicating instruments, and the train sheets at each station, on which are recorded the times of departure of all trains, both at the station recording and at the station in the rear and the station in advance, are filled out on information conveyed over the telephone, but no communication had been made by telephone concerning the northbound train. One of these signalmen was 19 years old and the other 21 years.

Derailment No. 3 is somewhat like collision No. 4, in that the man in charge of the switches in the signal tower was able to turn the switch while a train was passing over it, by reason of the lack of a suitable detector bar. As in the other case there was a detector bar in use but it was not long enough to provide for all conditions.

Derailment No. 10, killing 15 persons, of whom 14 were passengers, was due to the negligence of an engineman approaching an open drawbridge at a high rate of speed, so fast that the engine passed over a 24-ft. opening and struck the truss of the open drawbridge on the pier at the farther side of the opening. This engineman is reported to have had a good record, and he had had five years' experience, but he had been in the service of the road where the accident occurred only seven months and had not run over this part of the line at all until the fatal trip. It is said that he "knew the line pretty well," but this knowledge, such as it was, appears to have been accidental and not the result of any definite instruction or test on the part of the railroad company. At the same time it is to be observed that the line of road approaching the bridge is perfectly straight and that the day was clear. There is a warning signal at a point one-half mile before reaching the draw and a stop signal 300 ft. before reaching it, and the bridge itself, standing crosswise of the track, was in plain sight. Besides this the draw tender had displayed a red flag in the center of the track. The foreman who assigned this inexperienced engineman to this train and the conductor of the train had some conversation with the runner in regard to his knowledge of the line, but they appear to have been satisfied with a very incomplete knowledge of his qualifications.

The warning and stop signals being only fixed boards, in no way connected to the bridge, the rules require all trains to be stopped before crossing. The disregard of this rule and the fact that the engineman gives no rational explanation of his awful neglect indicate not only that he was poorly acquainted with the line, but that he must have been utterly heedless of all landmarks.

At a point about 500 ft. before reaching the bridge the porter of the train applied the air-brakes by the use of the conductor's valve in one of the cars in the forward part of the train, and this application appears to have been effective, as men in the train were thrown down by the sudden checking of the speed; but the porter's action was not soon enough to overcome the momentum of the train, and two of its six cars fell into the gap at the draw.

Telephones on O., R. & N. Telegraph Wires.

The instruments of the National Telegraphone Company have now been in use on the lines of the Southern Pacific in Oregon and of the Oregon Railroad & Navigation Company, for nearly a year, with excellent results. An officer of the company writes: Last spring we equipped our line between Portland and Roseburg, Oregon, a distance of 198 miles, with telegraphone instruments. Telephones were placed in the despatchers' offices at Portland and Roseburg, intermediate telephone sets were put into the telegraph offices along the line, and portable telephone sets in the cabooses. These caboose sets are connected with the telegraph wire by means of the usual extension pole.

These instruments have furnished good service, but we found it necessary to break the circuit at Junction City, a point 110 miles from Portland, as on account of the great number of intermediate telegraph offices and relays the telephone circuit was not entirely satisfactory for the longer distance.

These instruments have been for several months in regular service and are used frequently by the despatcher. They are also used by train crews in securing orders at blind sidings or between stations. I have in mind one instance where a freight train meeting with some trouble between stations which would delay it for several hours, immediately communicated with the despatcher by means of the caboose telegraphone instrument, and thus enabled

the despatcher to promptly move his other trains and avoid bad delays. We are experimenting with a later style of instrument furnished by the National Telegraphone Company, which is known as the "buzzer" or "howl" signal instrument. This is on our line between Portland and The Dalles, Oregon, a distance of 88 miles. These instruments have an improved signalling arrangement which does away with the slight interruption in the telegraph circuit, that was experienced on the instruments in use between Portland and Roseburg, and which was about the only objectionable feature about them.

The Cost of Locomotive Operation.

XXII.

BY GEORGE B. HENDERSON.

(*Concluded from page 95.*)

COMPARATIVE COSTS.

It often occurs that the comparative cost of operating over different profiles is desired. This may be needed in order to determine the wisdom of constructing a new line over a lower grade, or of altering an existing one. For instance, a survey is being made in order to connect two points 150 miles apart on practically the same level above the sea. One line can be built for a certain sum, but necessitates a 1 per cent. grade each way from a central summit; another line, more costly, can be built with one-half per cent. grades each side of the central summit. The question then arises: "Will the reduced cost of operation pay a sufficient interest on the increased cost of construction for the low-grade line?"

Table E (see *Railroad Gazette*, January 26, 1906), gave us the cost per 1,000 ton-miles for all combinations of speed and train load, and it appeared that 1,200 tons at an average speed between terminals of 12½ miles an hour could be transported at 50 cents per 1,000 ton-miles, including the operating charges embodied in items 10 to 22 inclusive.

Table F.

1. Speed up hill, miles per hour	5	10	15	20
2. Weight of train, tons back of tender	2,550	2,530	1,900	1,350
3. Ton-miles per trip, back of tender	383,000	380,000	285,000	202,000
4. Running time, hrs. bet. terminals	17.5	10.0	7.5	6.25
5. Actual time, hrs. bet. terminals	21.0	12.0	9.0	7.5
6. Average speed, between terminals	7.2	12.5	16.7	20.0
24. Cost, per 1,000 ton-miles, net	$0.36	$0.37	$0.39	$0.43
25. Million ton-miles per month	10.6	16.1	14.7	11.6

With Reduced Train Loads, Cost and Ton-Mileage.

	.47	.42	.43	.45
1,200 tons	5.0	7.6	9.3	13.3
	.44	.40	.41	
1,400 "	5.8	8.9	10.8	
	.41	.37	.39	
1,600 "	6.6	10.1	12.3	
	.39	.36	.38	
1,800 "	7.5	11.4	13.8	
	.37	.35		
2,000 "	8.3	12.7		
	.36	.35		
2,200 "	9.1	13.9		
	.35	.36		
2,400 "	9.9	15.2		

Table F gives the same information (condensed) for the second case mentioned above—that is, a 150 mile division with central summit approached by one-half per cent. grades. We again find the lowest cost in the column corresponding to an average speed of 12½ miles an hour, and with a train of 2,200 tons back of tender it amounts to 35 cents per 1,000 ton-miles. There would evidently be a saving of 50 — 35 = 15 cents for each 1,000 ton-miles hauled back of tender, but as this includes the deadweight of cars, which may be as great as the revenue load, we should conclude that 7 or 8 cents per 1,000 revenue ton-miles might be saved by such grade reduction. It is evident that the other charges, such as superintendence, maintenance of track, etc., would be little affected by the easier profile, so that the question resolves itself into one of traffic density. If a traffic of 1,500,000 revenue ton-miles per day could be depended upon, the saving per day would be 1,500 × .08 = $120, or for 300 days, $36,000 per year. If money could be borrowed at 4 per cent. interest this would represent a cash capitalization of $900,000, up to which amount the low grade line would be a paying investment. If the traffic were greater, then we could afford to spend still more in perfecting the line. There is still another advantage for the low grade location, and that is, that each locomotive could haul nearly double the ton-mileage each month, so that only about half as many engines would be needed to do a given amount of work.

There is considerable labor in calculating tables E and F, and if we wish to know the difference in cost of operating on two profiles, it will ordinarily be sufficiently close to simply figure the cost per 1,000 ton-miles at the maximum load which the engine can haul. Thus in table E we find this to be 51 cents (see line 24, five-mile column) and in table F, 36 cents. The difference is again 51 — 36 = 15 cents, precisely the amount found by the more laborious method of calculating various combinations of weight of train and speed. While the heaviest trains and slowest speeds do not give the minimum cost, as is apparent from Figs. 11, 12 and 13, yet as a rule the cost of transportation is not greatly in excess of the minimum, where the engine is so loaded, and for quick results figures based on maximum train loads will frequently be found useful, especially for comparisons; but when decisions are to be made as to the actual schedule and loading to be adopted, then the advantages of charts showing the cost and quantity of freight moved will be very great.

Stopping and Starting.—Our analysis would hardly be complete if we did not consider the often discussed problem—the cost of making a stop. In the chapter on fuel we determined the amount of coal necessary for stopping and starting a train of 2,000 tons back of tender on a level track. This was found to be 213 lbs. greater than would have been burned if the train had continued moving uninterruptedly at a speed of 27 miles an hour, which was the maximum speed possible under the assumed conditions. We also found that the stop would require 16 seconds of time and 320 ft. of distance, while to accelerate the train to 27 miles an hour again would require 10 minutes and 34 seconds and 19,113 ft., or a total loss of 10 minutes and 50 seconds (without allowing any time for remaining stationary). The amount of water corresponding to this quantity of coal would be three-quarters of 213, or 160 gallons. Items 12 and 13 would evidently not be affected under our methods of analysis.

The cost of locomotive repairs would be increased, as the drawbar pull would be greater during acceleration than when running uniformly at 27 miles an hour. In the latter case the drawbar pull or tractive force would be about 19,000 lbs., or 9½ tons, so that the cost would be 9½ + 1 = 10½ cents per mile. During acceleration, this force would probably average 30,000 lbs., or 15 tons, and the corresponding cost would be 16 cents per mile, the difference being 5½ cents. As the distance through which acceleration takes place is over 19,000 ft. we can call it four miles, making an increased cost of 4 × 5½ = 22 cents for wear and tear on the engine.

The pay of enginemen will be increased under some conditions. Thus if the average speed for the trip is less than 10 miles an hour, and the 11 minutes lost by this stop is not made up, it will appear as overtime. If it be made up, or if the average speed, with the stop included still exceeds 10 miles an hour, then no overtime will be called for. We are now considering, however, that the time lost by stopping is not made up and must be paid for as overtime. Then at 70 cents per hour we shall have $\frac{11}{60} \times 70 = 13$ cents; so for the trainmen at 80.5 cents an hour, we have $\frac{11}{60} \times 80.5 = 15$ cents. As interest was assumed at 10 cents an hour, the excess will be 2 cents.

We can now tabulate these extras as shown below:

Coal, 213 lbs. at $1.00 per ton	$0.10
Water, 160 gallons at 10 cts. per 1,000	.02
Repairs, 4 miles at 5½ cts.	.22
Enginemen	.13
Interest	.02
Trainmen	.15
Total	$0.64

There should properly be added an amount representing the wear of brake-shoes, wheels, etc., but no data is at hand for this purpose; in a general way, it is covered in regular repair charges. Still, it must be excessive and abnormal at such times, and the money value has been variously estimated at from 9 to 15 cents a stop. If we allow for this, it would put our cost at 75 cents under the conditions which we have considered.

In October, 1905, Mr. J. A. Peabody gave some estimates of cost of stopping trains in a paper presented at the annual meeting of the Railway Signal Association. These were generally what might be called "high-class guesses," but as they were made by competent railroad officials they are worthy of consideration. The values given were as follows:

Passenger trains	530	tons,	50	miles	speed	$0.42
Freight trains	2,000	"	35	"	"	1.00
Passenger trains	400	"	45	"	"	.35
Freight trains	1,500	"	15	"	"	.56

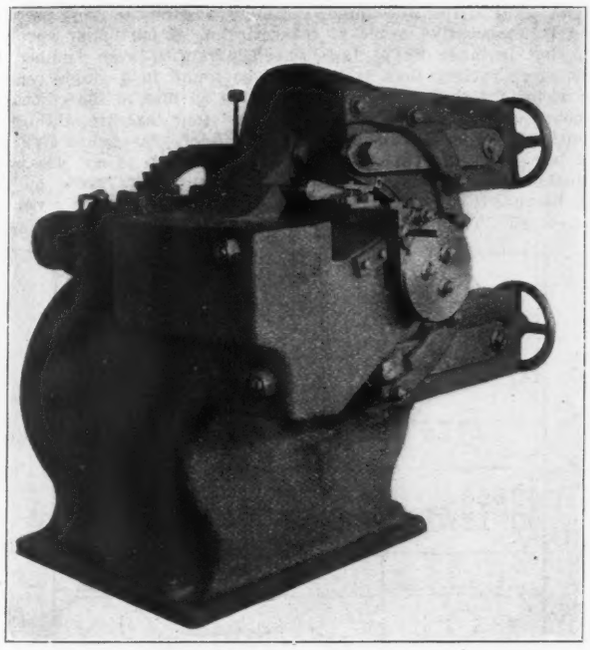
It would appear, therefore, that the amount shown by our calculations, viz., 75 cents, corresponds closely with what might ordinarily be expected by railroad officials, even if the individual items composing this amount do not agree in detail. It is evident that the method just discussed will give different results for different conditions of train load, grade, etc., but it is perfectly proper that this should be so. As with all questions of operating costs, it would be extremely difficult, if not impossible, to compute accurately the cost of any definite stop, yet we have here the elements which evidently enter into the problem, and they will surely affect the total figures in accordance with their relative importance. It

is believed that the results will be sufficiently accurate and reliable for all practical purposes, and especially so for making comparisons, which, it has been stated before, was the particular object sought to be accomplished by this study.

(*The end.*)

The Acme Rotary Thread Rolling Machine.

In the rotary thread rolling machine made by the Acme Machinery Co., Cleveland, Ohio, the threading dies, instead of being of the reciprocating type, are composed of one rotary or revolving die which runs continuously in one direction, and one segmental die which remains stationary after it is adjusted to the work. The bolt or piece that is to have the thread rolled on it is passed between the two threading dies and carried around with the rotating die, which is mounted on the main shaft or spindle. The illustrations show the general construction of the machine, and it will be seen that it differs radically in construction from roll threaders of the reciprocating type. The adjustment of the distance between the two dies which control the diameter of the work, is effected by means of the hand wheels shown. The segmental die is carried in a heavy block that is eccentric to the shaft, and by loosening one of the hand wheels and tightening the other, the adjustable die is advanced or withdrawn from the rotary one. The feeding mechanism is also clearly shown in the line drawing; A is the rotary die, B is the adjustable shoe carrying the segmental die, and C is the driving spindle.



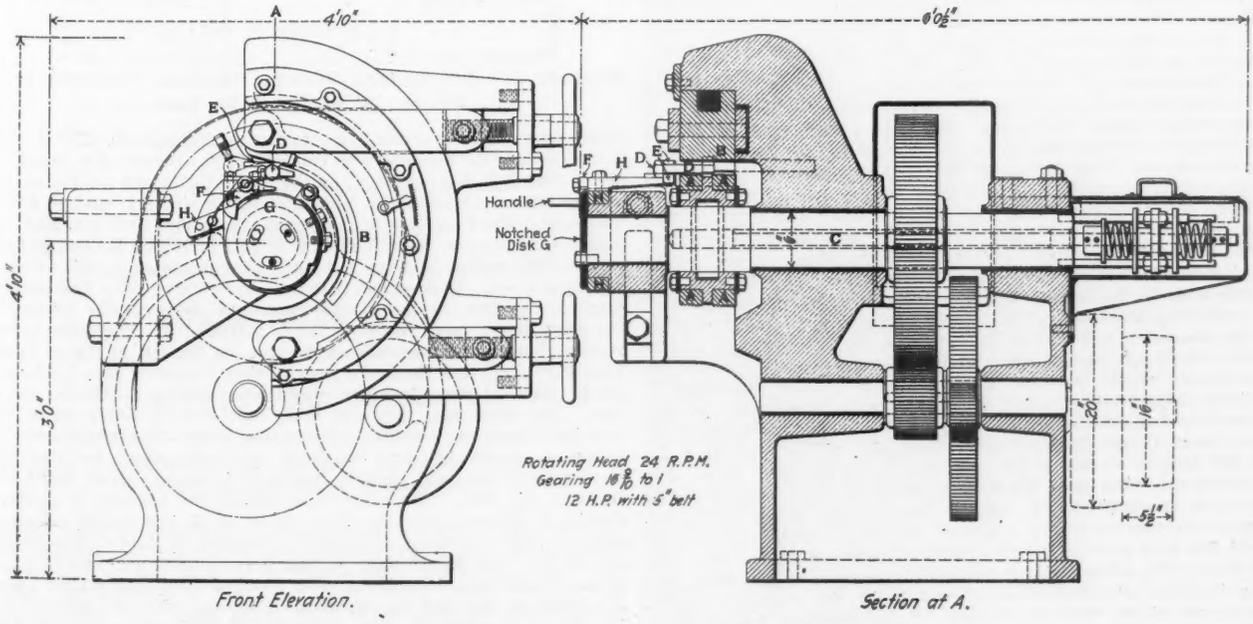
The Acme Rotary Thread Rolling Machine.

The bolt D is placed in the jaws E, the operator starts the bolt into the machine by moving a handle (extending out from the feeding carriage) attached to pawl F. This handle, which is shown in the half-tone illustration, drops the pawl into engagement with the notched disk G, which carries the oscillating carriage H forward and passes the work between the dies, the rolling beginning at once. The jaws then open automatically and allow the carriage to drop back by its weight to the feeding position again. There are four opportunities for feeding in every rotation of the die, as there are four notches in the disk. The bolt or rod is fed into the machine horizontally so that bridge rods, car truss rods or other work of almost any length may have threads rolled on the end. At the rear end of the main spindle there are two spiral springs and means for putting them in tension; this is an important feature, as it keeps the dies in pitch. As the bolt enters and the rolling begins at different points on the dies, the breaking down, or the beginning of the thread, is not confined to one particular place, so that the wear is general and uniform over the whole die surface. The dies admit of fine adjustment for the required size of work, or to compensate for wear.

The following results of a recent test showing the comparative merits of cut and rolled threads may be of interest. The material in both cases was machine steel. A 1¾ in. x 24 in. piece with a cut thread showed a tensile strength of 88,900 lbs., whereas a piece of like dimension but with a rolled thread showed a tensile strength of 95,850 lbs. The rolled thread is, of course, not adapted for every purpose, still the above test shows that where it may be used there is a great gain in strength and a consequent saving of weight and cost. The saving in weight of material is about 20 per cent., that is to say, material 20 per cent. lighter than would be used if the threads were to be cut, may be used if the threads are to be rolled and there will be no loss of strength. It is also claimed that there is a gain of about 100 per cent. in time as at least twice as many bolts may be rolled as may be cut in a given time.

These machines are made in a 1-in. and in a 2-in. size. The 1-in. machine will cut threads from ½ in. to 1 in. Its weight is 10,000 lbs., and it occupies a floor space 4 ft. 10 in. x 6 ft. 6 in. The 2 in. machine will cut threads from 1 in. to 2 in.; its weight is 20,000 lbs., and requires a floor space of 7 ft. x 9 ft.

One of the Prussian State Railroads sought to satisfy the clamors for a branch to a town some 3¾ miles from the nearest station by establishing an automobile service running to connect with five trains daily, and capable of carrying 13 passengers, with fares 7 and 10 cents for two classes. The public was pretty well satisfied except the cab drivers,, who were forced out of business; but the railroad less so, for it received in a year $1,806. while the service cost it $3,198. More than one-fourth of the cost was for renewing tires.



The Acme Rotary Thread Rolling Machine.

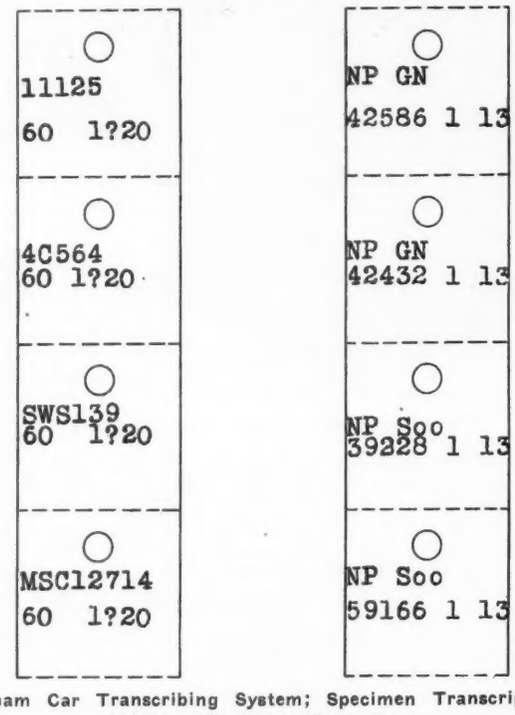
Beecham Car Transcribing System.

The problem of securing prompt and accurate records of car movement has long been one of the most difficult which railroad officers have had to face. To promptly record the facts shown on the hundreds or thousands of conductors' and agents' reports which daily come into the office of the Car Accountant or Superintendent of Car Service has always been a hard thing to accomplish. One particular cause of delay has been that each report has had to pass through the hands of every record clerk in the office, in order to give each man a chance to take off from it the records of such cars as fall within the particular group or series assigned to him for recording. In this process any one clerk may in a list of 50 or more car movements find only three or four of his series of cars. Yet it has been necessary for him, in order to make sure, to read over all the car numbers listed on all the conductors' reports. This takes much valuable time. In order to obviate this loss, and in other ways to simplify the work of car recording, a system of transcribing car records was put into effect eight years ago on the Chicago, Milwaukee & St. Paul by W. E. Beecham, Car Accountant of that road, whose invention it was and who holds the patent for its use. The transcribing feature of this system was on August 1st adopted in the office of the Car Service Agent of the Chicago & North-Western, and on September 1st the Atchison, Topeka & Santa Fe began a similar method of car transcribing. In order of its adoption, the Beecham system is now in use on the Chicago, Milwaukee & St. Paul, Illinois Central, Burlington, Southern, St. Louis & San Francisco, Pennsylvania Lines both East and West (which adopted it May 1st), Chicago & North-Western, Atchison, Topeka & Santa Fe and Missouri Pacific.

Under this method of transcribing conductors' and interchange reports, instead of being passed about among the record clerks, are on coming into the office at once turned over to girls who on typewriters transcribe the essential facts of each car movement on a perforated stiff paper ribbon, each division of which represents a car movement. This work is done by an ordinary Oliver typewriter, the marginal stop of which is set to run the width of the tags. At the back of the machine is connected the Beecham attachment, which is a reel over which the strips of tags are run. The tags come in a roll and are rolled from the reel on a guide, which fits on the apron of the carriage of the machine. When a convenient length of tags has been written off, the printed part of the roll is torn off and goes to sorters, who tear apart the perforated slips and sort them according to the requirements of the particular office system. The tags are of different colors, each color representing a different class of car movement. Each tag has in its upper side a round hole, to be used for inserting a pin or spindle. The sorting is done by young boys or girls who put on separate spindles all tags which represent those cars which are assigned to each record clerk. The record clerks then make up their book records directly from the tags turned over to them by the sorters. This is in general the system as used on all of the roads.

Its most complete development is on the Chicago, Milwaukee & St. Paul, where not only are car movements transcribed by this method, but all car records, except those of foreign cars on the line, are actually kept by means of the typewritten tags instead of, as is the general practice, in books. These tags are 1 in. square with a round hole in the top into which will fit an aluminum pin. White tags indicate the movement of loaded cars, both home and foreign, over Chicago, Milwaukee & St. Paul lines; yellow tags cover empty movements of all cars; brown, work train movements, red, delivery of cars off the line (i.e., to foreign roads); blue, return to the line from foreign roads, and green, deliveries of St. Paul cars from one to another foreign line as reported on postal card junction interchange reports. Two strips of four printed tags, each parts of longer strips transcribed in the office of the Car Accountant are reproduced (actual size) in the accompanying illustration. The first strip is on white paper. The top tag shows that C., M. & St. P. car 11,125, loaded, arrived at Milwaukee (whose symbol number is 60), January 20. The interrogation point between the month and the day of the month is made by a particular operator on every tag she transcribes. Each operator is assigned a typewriter character, not used in transcribing, for identification of her work. As in any case, a space would need to be made between the two figures which represent the dates and it takes no longer to strike a character key than a space key on the typewriter, no time is lost by putting in the identification symbol. The second tag shows that Canda Cattle Car Company (familiarly abbreviated as 4 C), car 564, loaded, arrived at the same station on the same date. The third tag gives the same information about Street's Western Stable Car Line, car 139, and the fourth, about Mather Stock Car 12,714. These four tags evidently represent part of a loaded stock train which has arrived at a junction point or terminal on its way from the west. The other strip of five tags is green and represents part of a junction interchange report sent in by the Northern Pacific. The record shows that on January 13 the Northern Pacific delivered C. M. & St. P. cars 42,586 and 42,432 to the Great Northern, and C. M. & St. P. cars 39,228 and 59,166 to the Minneapolis, St. Paul & Sault Ste. Marie. As this strip was taken from an actual record, the tags naturally all show delivery on the same date. There is in this case no mark of identification necessary, because all transcribing from postal card junction reports is done by one operator.

The shape of the tags used on the Chicago, Burlington & Quincy, Chicago & North-Western, and other roads is also illustrated, actual size. This strip was made up from actual transcriptions in the office of the Car Accountant of the Burlington. On this road, white tags represent C. B. & Q. cars moved on the line; yellow tags, foreign cars moved on the line; pink, deliveries of all cars both home and foreign to connecting lines, and lavender all cars received from connecting lines. A salmon colored tag has been used for Burlington & Missouri River R. R. in Neb. cars, but with the numbering of these cars in regular series with C. B. & Q. cars, its use is being abandoned. This strip does not, as in the case of the St. Paul strips illustrated, represent a series of tags as they came in consecutive order of transcription of particular car records, but is made up of tags selected from a large number, to show more variety than is likely to be found in a single record. The strips are shown unseparated to give an idea of the ribbon as it looks before it is torn apart. The first four tags are white, representing C. B. & Q. cars moved on the line. The figure 8 in the first tag means the 8th of the current month. It is not necessary to include the number of the month in the facts given on the tags, because the tags are not, as on the St. Paul, used for a permanent record. The book records are made up long before the 30 days,

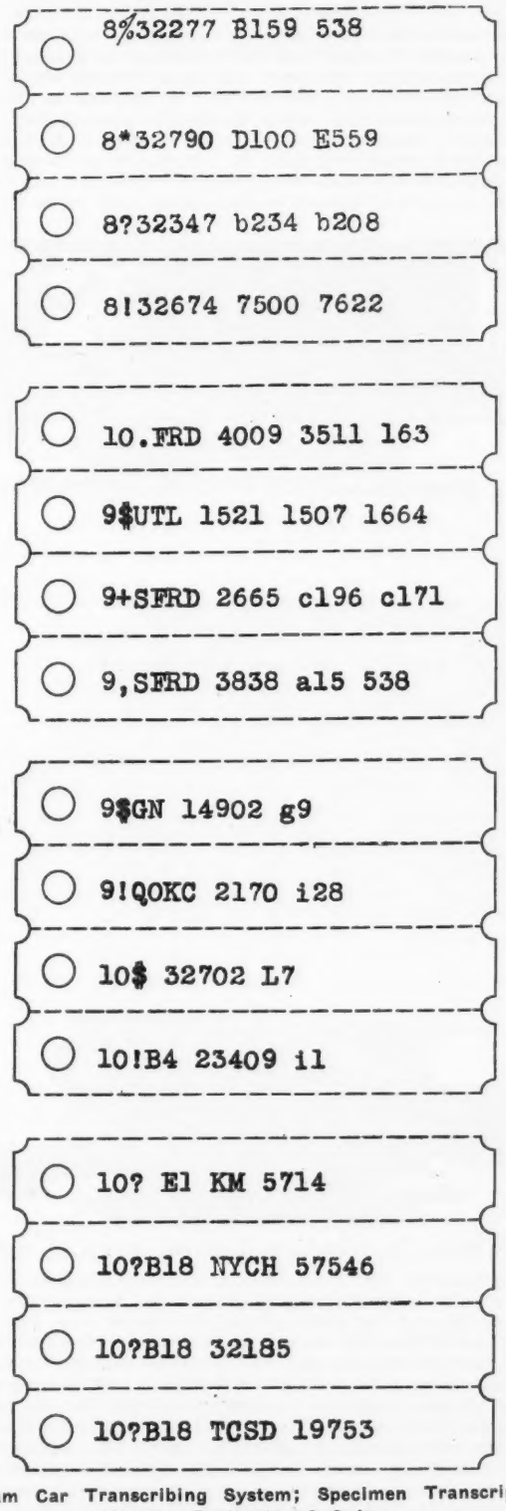


Beecham Car Transcribing System; Specimen Transcriptions; Chicago, Milwaukee & St. Paul.

which would have to elapse to create any confusion, pass. The % sign is the mark of the operator who transcribed the record. The tag then shows that C. B. & Q. car 32,277 on the 8th of the month arrived at the station whose symbol is 538 from the station whose symbol is B159. The second, third and fourth tags, each transcribed by a different operator, show that on the 8th, C. B. & Q. cars 32,790, 32,347 and 32,674, respectively, moved between the stations represented by the symbol numbers given. The second four tags are yellow. The first shows that on the 10th of the month Fairbanks' Refrigerator Despatch car 4,009 moved from station 3,511 to station 163. The other three represent similar movements on the line, on the 9th, of Union Tank Line car 1,521; and Santa Fe Refrigeratar Despatch cars 2,665 and 3,838. Each of these four tags was transcribed by a different operator. The third four tags are pink, representing deliveries of all cars both home and foreign to connecting lines. The first shows delivery on the 9th of Great Northern car 14,902, which left the line at junction point G9, which interpreted means Great Northern Railway, St. Paul. The other three record the delivery of Quincy, Omaha & Kansas City car 2,170, C. B. & Q. car 32,702 (initials omitted), and Cleveland, Cincinnati, Chicago & St. Louis (Big Four) car 23,409. The fourth strip of four tags is lavender, recording receipts of all cars, both home and foreign, from connecting lines. All came on the line on the 10th. The tags were all transcribed by the same operator. The Kanawha & Michigan car 5,714 was received at junction E1; the others, the New York Central, C. B.

& Q., and Toledo, Canada Southern & Detroit (Michigan Central) cars, all at junction point B18. These examples from these two roads cover the general plan of the transcribing.

On the Chicago, Milwaukee & St. Paul an average of about 30,000 car movements are transcribed daily, with a maximum of 53,000 on Mondays. The average number of train reports received daily is about 900, with a maximum of 2,250. There are 29 type-



Beecham Car Transcribing System; Specimen Transcriptions; Chicago, Burlington & Quincy.

writers used in transcribing. The average number of transcriptions per machine per hour is 320, with a maximum of 570. The tags are distributed by the force of 40 transcribers and sorters onto pins fitted into a series of inclined boards. Each C. M. & St. P. car has its own pin. Each board holds 2,500 pins, or 2,500 cars on each side, a total of 5,000 cars to each board. The boards are inclined and attached to each other in an inverted V shape, with the vertex of the angle a little over 6 ft. from the ground. Each pin fits into a space about 1¼ in. square, which leaves room for reading the tags on the pins or for easily detaching the pins from the board. The pins are 8 in. long and will, it has been found, hold on the average the record of every movement of a car for three years. When a pin is filled to its capacity, the oldest year's tags are removed and filed away for future reference. The tags are placed on the pins as they come into the office, so that unless there is some omission or mistake in the records received, each pin represents chronologically every movement of a particular car. When a car is wrecked or for any reason a car number becomes vacant, a pink tag, on which are briefly noted the circumstances, closes the history of that car. By detaching a pin and examining the tags, not only can the detailed history of any car be traced, but simply by a glance at the colors of the edges of the tags as shown when the pin is removed from the board, a rough estimate can be made of the length of time a car has been off the line, or on the line, loaded or empty. In the same way by a glance at the surface of a board it is possible to tell at any time by the proportion of each color on the top tags which meets the eye how the particular block of equipment which it represents is at the moment distributed. The spaces on the boards which are covered by the tags form a rectangle about 31½ in. high. The sections 1¼ in. square in which the pegs are fitted are arranged in a regular series of numbers as in a car record book, with 25 cars in each up and down row or two rows for every range of 100 numbers. As on most roads, the equipment is distinguished by the numbering. Box and furniture cars bear even numbers and stock, flat and coal cars, odd numbers. Thus 50 cars of one class cover a range of 100 numbers. Records of foreign cars are transferred from the tags to a book, but these are the only book records kept. When the system was installed in 1898 there were six such boards; now 12 are in use. In order to distinguish between the records of different years, the color of the typewriter tape used is different each year. Last year a brown tape was used and in 1904 a purple tape. This prevents any possible confusion between the records of these years and of the present year, when a green tape is being used. When a record is missing, the top tag is faced down, until the matter is either squared up, or five successive movements on the home line have been reported, when the tag is turned back and the record proceeds as before.

The principal advantage of this system of keeping car records is that it is easy to get at. If information about any particular car is desired for a tracer it is not necessary to interrupt a man who is working on a record book while the information is being obtained, but simply to go to the board which contains the pin for that particular car and obtain the facts desired. When there is special necessity for finding out the location of the equipment quickly, the whole office force is immediately employed in obtaining the information from the boards, whereas only as many as ordinarily work on books can simultaneously be employed under the book record system. On one board containing the records of 5,000 cars, 12 people can work at once. This number of cars would ordinarily be divided among from one to three books. This means that information can in general be obtained four times or more as quickly under the board record system. Every ten days, when the location of all equipment is reported to the general officers, by thus employing the entire force on the boards, the whole account is made up in no more than half an hour. For a little more than a year, the transcribing system has been applied to the monthly per diem reports from other roads. These are written off on a typewriter by an operator just as though they were conductors' reports, are then sorted into numerical order (which shuffles them out of arrangement by separate roads) and turned over to the most skillful of the girls employed in the office for comparison with the board record of the same cars. Where the two entirely or practically agree, the foreign road's claim for per diem monthly payment is received as correct. In cases where there is an obvious discrepancy, the facts are recorded on the back of the per diem tag and the claim returned to the other road for correction. It is obvious that this checking requires considerable head work, as one needs to know not only the names and general location of all of the important railroads in the country, but the principal connections of the home road, the arrangement of the line, the probable junction point where a car would be received from each foreign line and the length of time which a car would normally take in going between any two points on the home line or between the principal points on foreign lines. If, for example, in the month covered by the per diem statement a green tag shows that the car has been delivered by the New York, Chicago & St. Louis to the Erie and the next tag is a white one, which shows that the car arrived at Milwaukee ten days later, it is necessary for the girl who is checking up the account to know how long it would probably take to haul the car from the most probable junction point between the St. Paul and the Erie to Milwaukee. If the number of days per diem allowed by the Erie corresponds to the length of time which it would have normally held the car if it had been thus forwarded to Milwaukee, the statement is accepted as cor-

rect, and no further examination made of the matter. If, however, there is such a discrepancy that by no probable chance could the car have been held by the Erie so short a time as indicated, the record is taken up with that road for further adjustment. According to Mr. Beecham, the girls who do this work, all of whom were entirely ignorant of the business, have become so skillful and intelligent that they not only give complete satisfaction but save over 50 per cent. of the labor formerly required. A two weeks check of the work after this method of tracing had been in effect for two months showed a loss to the road of only 40 cents out of a total of thousands of dollars.

Before the transcribing system was adopted, there were four men employed in figuring penalties, six in figuring per diem, eight on foreign records and two in tracing foreign cars, a total of 20 men. Under the present arrangement, 11 men are employed on foreign records, one man on penalty work, two on tracing and other similar work and four on miscellaneous work, an actual saving of two men. More than this, while under the old system the record clerks uniformly had to work at least six evenings a month, there is now not only no necessity for such overtime but only half the day has to be spent on record work. The flexibility of the transcribing system is being further taken advantage of by distributing the hours of the working day. In order to have information about car movements as promptly as possible, most of the office force is employed in the morning on transcribing and filing the car records received that day. It has been found that this can all be done by noon, which leaves the rest of the day free for using the records already obtained, when most of the force is transferred from the transcribing and filing work to tracing per diem and other work in which the records are used. That is, the morning is devoted to making records and the afternoon to using them. By this means, the records are obtained promptly, instead of being two or three days late, as not infrequently happens under the book record system. Thus also each member of the force becomes able to do intelligently most of the work of the office, and the employment, because of its variety, is less monotonous. The office force is made up of 83 persons, 19 years old on the average. Fifty of these are girls. At present, the average member of the force has been in the office considerably less than a year, which shows the intelligence and skill with which the new work has been taken up by the beginners. Some of the brighter girls are able to do per diem work successfully with less than six months practice.

On the Chicago, Burlington & Quincy, the Beecham transcribing system has been in force for two years. An average of about 2,800 records daily are transcribed by each operator and individual records have run as high as 4,200 transcriptions. Not only is the operator who makes the record identified, but each person who sorts the tags makes a distinguishing pencil mark on the back of each strip so that it can at once be told by whom each separate slip was sorted. The tags are not used for a permanent record as on the St. Paul. They serve three purposes: First, for entering car movements on running record; second, a record of C. B. & Q. cars on foreign roads; and, third, for use in making up junction cards to be sent out to foreign roads. The shape of the tags and details of the transcribing have already been illustrated. On the Chicago & North-Western, white tags represent loaded cars; yellow, empty cars; salmon, loaded interchange records; pink, empty interchange records, and red, junction postal card reports and shop reports. On August 1st, the first day the transcribing operators were used, the average number of transcriptions was from 1,200 to 1,300 for each of the 20 girls employed. On August 9th one of the girls succeeded in turning out 3,600 transcriptions. There are, in the train reports received daily, about 6,000 interchange reports. About 1,500 junction cards come into the office every day. The information transcribed from the conductors' reports shows initials (except Chicago & North-Western cars), the symbol number of the station where left and the date. On the Pennsylvania Lines East of Pittsburg, where there is a force of 450 people employed, some 4,800 train reports and 135,000 car movements are recorded each day. This requires 60 transcribing operators.

The advantage of the Beecham transcribing system, as shown in this description of its operation, is in a saving of time and money. By the substitution of inexpensive labor for more highly paid labor it costs less to do the same work. Instead of having a clerk spend his time searching out the material which he needs for his records, this work is done by young girls and boys whose time costs the company perhaps half as much and the clerk has all his time to put directly on his work of recording. This redistribution of the work of car recording not only saves money but what is in this case more important, saves time. Records become available promptly instead of often being several days or a week or more late. This is a most important advantage, for it enables operating officers by keeping close track of the equipment to run the road more economically and effectively. In addition to the widely recognized value of the system in transcribing, the experience of the St. Paul shows that it can be used with success as the sole record of car movements. Although the wisdom of transcribing car records has been the subject of debate at various conventions and is not yet officially established, the facts here presented by different users of the system seem good proof of its successful operation.

Motive Power in Mines.

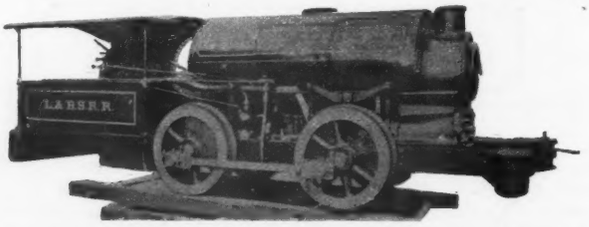
BY C. H. CARUTHERS.

The subject of motive power as used on the railways of mines, may be considered under three heads; haulage by animals, haulage by ropes actuated by stationary engines or water-power, and haulage by steam, compressed air, and electric locomotives. Beginning with animal power, the writer distinctly remembers in his very tender years, standing astonished at the sight of a grimy man and a large dog attached to a small hand-cart as they emerged from a bituminous coal mine near Pittsburg, Pa. Both man and dog were fitted with a sort of harness which enabled them to draw the cart

Grice & Long Mine Locomotive, 1872.

with ease, and as the passing days rendered the sight familiar, I learned that these dogs were cared for in regard to food, etc., by their owners in a way to render them efficient in the service required. Although the mine was a large one, this was the only mode of hauling used in it for several years. Then rails were laid and larger cars drawn by mules took the place of the "mixed" power first mentioned. As the horse and the mule, especially the latter, have been very familiar features around and in coal mines for many years, it will suffice to say that both have proven valuable servants to coal operators, and the mule seems especially adapted to that class of work as he is very sure-footed and is therefore able to safely maintain a high speed ahead of trains of cars when descending steep grades in the uncertain light afforded by the driver's lamp; and he soon develops an almost human familiarity with the different parts of the mine in which he works, so that he obeys the commands of the driver with an intelligent perception of their meaning, and is driven without reins, and often without a bridle.

As the years passed on, the workings of many mines gradually receded to such a distance from the original entrances that it became necessary either to locate new points of loading the output on cars, nearer to these workings and extending the railway sid-



"Grand Mulet," Built by Smith & Porter (Now H. K. Porter Co.)

ings to them, or else to adopt some mechanical means of hauling the coal to the original openings which would accomplish the object more rapidly and economically than was possible with the continued use of the faithful four-footed servants. This latter idea was generally the more feasible and was especially desirable from an economical standpoint as it only involved some slight changes in the entries already opened in the mines, whereas new openings and approaches could only be constructed at considerable cost. The first means of mechanical haulage adopted, as far as can be accurately determined, was the use of ropes driven by engines or other power located at or near the mouths of the mines. Two systems were used; the first consisted of an endless rope arranged somewhat as on street cable lines. The cars were attached to this rope at any point and in any number up to the maximum capacity of the engines, by means of "grips." The other system was called the tail rope system. In it the rope while forming the complete circuit of the portion of the mine in which it was used, was not continuous, and could be so adjusted that the two ends would be distant from each other in proportion to the length of the trip which was at-

tached. These ends were fitted with couplings, by means of which one end was attached to the front of the train and the other to the rear, thus forming, when so coupled, a practically endless rope, but without the advantage of enabling cars to be attached at any point. Signals, in both systems, were communicated to the engineman by a double line of wires connected to an electric bell in the engine room. The "rope-rider," as the man in charge of the train was called, carried a T shaped piece of steel, and by bringing this in contact with both wires, actuated the mechanism of the bell. One disadvantage of the rope systems, especially when the tail rope was used, consisted in the fact of the engineman being at such a distance from the trains, and the consequent delay in receiving signals when an accident occurred; indeed, the rope-rider was often thrown from his seat so suddenly in case of derailments or breakdowns that he was unable to get at the signal wire until considerable damage was done to the cars and the road, or the timbering of the mine. As an offset to this disadvantage, the use of either system required but little change in the contour of the entries in which they were placed, or in the tracks already in use before their installation.

Mine owners next turned to the steam locomotive as a more desirable means of bringing the products of their pits to the surface, and from 1870 to 1900 many were put into service. In most instances the entries or passageways in which they were used rarely exceeded 6½ ft. in height and 8½ ft. in width. Often they were of considerably smaller dimensions, and I recall seeing at the Paris Exposition of 1878 a mine locomotive of the inside-connected type built and exhibited by an English firm, for use in a colliery where the height of the entries did not exceed 42 in. This little engine was not over 3 ft. in height and was built with a very long footplate to enable the driver to partially lie down while the engine was running. On account of the space limits where these mine locomotives were to work, most of those first built in America used inside cylinders, but the difficulty of access to the eccentrics, links,

Mine Locomotive Built at the Baldwin Works, 1872.

guides, etc., when so crowded together, proved a great objection and the outside cylinders were generally used on all that followed. A Philadelphia, Pa., firm which has not only passed out of existence, but of which it seems difficult to obtain any data as to its passing, Grice & Long by name, endeavored to obviate some of these objections by building geared locomotives for mining purposes, and in addition to increased facility of access to the various parts, thought to greatly increase the power in proportion to the space required by the entire machine, as they were geared about two revolutions of the shaft driven by the cylinders to one of the main driving axle. Two types of these engines came under my notice, one, the Geo. W. Huntzinger, of which a photograph was sent me by the builders about 1872, and which had the cylinders, etc., immediately behind the boiler and set at an angle of about 30 deg. The engineman sat behind these. The other type had a space for the engineman between these inclined cylinders and the firebox end of the boiler, and was brought to one of the collieries of the Penn Gas Coal Company, about 26 miles east of Pittsburg, Pa., in 1871 or 1872, but proved unsuccessful and was returned to the builder. This lack of success, my later experience with mine locomotives taught me, may have been the fault of incompetence and "crankiness" on the part of those handling it rather than the fault of the locomotive itself. Both types were entirely covered over with a sheet-iron roof, and both had their fire-doors on the side of the firebox.

Some manufacturer in the anthracite coal region of Pennsylvania thought to simplify these mine locomotives by using oscillating cylinders. Several, I believe, were built, but could not have been used to any great extent and even their memory appears to have passed out of the region where they were built, yet in 1903 I saw one at a machine shop in Goldsboro, N. C., to which it had been brought for repairs by its present owner. The badge-plate, if it ever had one, and every other indication of the maker's name had vanished. My most extensive experience with a mining locomotive was at the mine of the Westmoreland Coal Company, at Irwin, Pa., from 1873 to 1880. The company bought and placed in service, early in 1873, a Porter, Bell & Co. (now The H. K. Porter Co.) engine of 8 in. x 14 in. outside cylinders, 28 in. steel-tired drivers, and weighing 14,000 lbs. A steam pressure of 130 lbs. was carried. The service was chiefly drawing empty cars in trains having an aggregate weight of from 36,000 lbs. to 45,000 lbs., a distance of one and one-quarter miles up an almost continuous grade varying from 100 to 200 feet to the mile, and after our men learned to obey orders we had but little trouble, except that caused by the occasional necessity of using water strongly impregnated with sulphate of lime. This, of course, caused foaming, and was also disastrous to the firebox. The engine was seldom used in connection with the outgoing loaded trains as they were handled by gravity, but if by accident they became stalled in one of the two "swamps," or hollows on the line, they never seemed to cost the little machine any great trouble to start them over the "knuckle." This engine, like most of those built for mining purposes by the Porter people, was free from the unpleasant and somewhat dangerous rocking motion of many small locomotives without a truck. This was owing to the use of a somewhat shallow firebox, sloping upward toward the rear, and having the back pair of drivers placed underneath it. Although the main pins were on the wheels of this rear axle, the eccentric were on the forward axle, and we experienced no trouble with our valves from this arrangement, nor did the increased length of wheel-base prevent the engine curving freely, or cause it to leave the rails on the very sharp curves prevailing on portions of the line. We used coal obtained near the outcroppings and did our firing outside, at the main entrance of the mine, while the train was making up, and generally had very little smoke while working in the mine as we used considerably contracted exhaust nozzles, no netting or cone, and had a ventilating fan placed at the mouth of the mine. The small diameter of the drivers and proportionately large stroke of the cylinders threw the rod pins very close to the rims of the wheels, and hence the rods occasionally struck rather hard pieces of coal which had fallen beside the track and loosened the keys. It has always been a mystery to me, anyway, why the builders of mine and other small locomotives have generally persisted in the use of parallel rods fitted with split brasses and the necessary straps and keys, instead of using the more simple solid end rods, as in general railroad practice. This trouble referred to would be obviated to a great extent, and besides as much of the attention given these engines is usually by men of but little mechanical ability, the parallel rods would be kept in better condition, fewer cut pins would be found, and the alinement of the drivers, etc., would be better preserved.

The advance in the use of compressed air as a power for driving machinery led to its use in locomotives adapted to it. Probably that used in driving the Saint Gotthard tunnel was the first instance of such an underground locomotive. This engine was used at the Airolo (Italian) end of the tunnel, and was provided with a large cylindrical tank placed horizontally on the frame in place of the boiler. The air was compressed by power obtained from a waterfall, and the pressure carried in the reservoir on the locomotive was, I believe, 600 lbs. It passed thence to the cylinders through a reducing valve which brought it to a reasonable working pressure. Pipes carried into the workings both afforded ventilation and enabled the engine to obtain a fresh supply if necessary. Compressed air locomotives were afterwards installed in some American collieries, and appeared to give fair results.

The electric locomotive next attained such perfection that it has been specified in nearly all orders placed for mining locomotives during recent years, and the Baldwin people inform me that with the exception of a few compressed air locomotives, they have built nothing for mining purposes but electric for a long time. Admitting all the convenience of an electric locomotive from a practical experience in that department of mine work I will say that if the builders of compressed air engines will provide reducing valves which are simple, yet perfectly reliable under all conditions, and will also make the storage reservoirs of these engines of such a type that explosions will either not occur, or their effects be nullified, or better still, if effective results can be gotten from much lower initial pressures, the compressed air locomotive will supersede all others for use in mines, as it does not carry with it the danger of igniting gas in a fiery mine, and its very exhaust is an aid to the ventilation.

One trouble with which all mine locomotives have to contend in most mines is the great amount of moisture on the rails. This necessitates the use of much sand, and this in turn causes a very rapid wear of the tires with considerable cost for turning and renewals. The opponents of the steam mine locomotive urged as an

objection that its exhaust would disintegrate the mine roof and cause dangerous falls, but I have found this disintegration no greater on the engine entries than in the parts of the mine where the engine was never taken.

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There is an express train between Basel at the northwest corner of Switzerland, and Chiasso in Italy, passing through the Gotthard Tunnel, which has won the name of the "poor man's lightning express," mainly because it carries third-class passengers, and its third-class cars have cushioned seats and head-rests. There are also first-class cars in the train but no second-class. The train leaves Basel at 7.15 a.m. and arrives at Chiasso at 3.49 p.m., and starts back immediately, arriving at Basel at 10.55 p.m. The third-class cars have an enormous patronage, northern Europe being full of Italians who do the kind of work they do here, and pass to and fro, according as their jobs last. It is comparatively a new thing for express trains to carry third-class passengers on the Continent; but there are many routes, like this, where an enormous travel is to be had, often much more profitable than the high-class travels.

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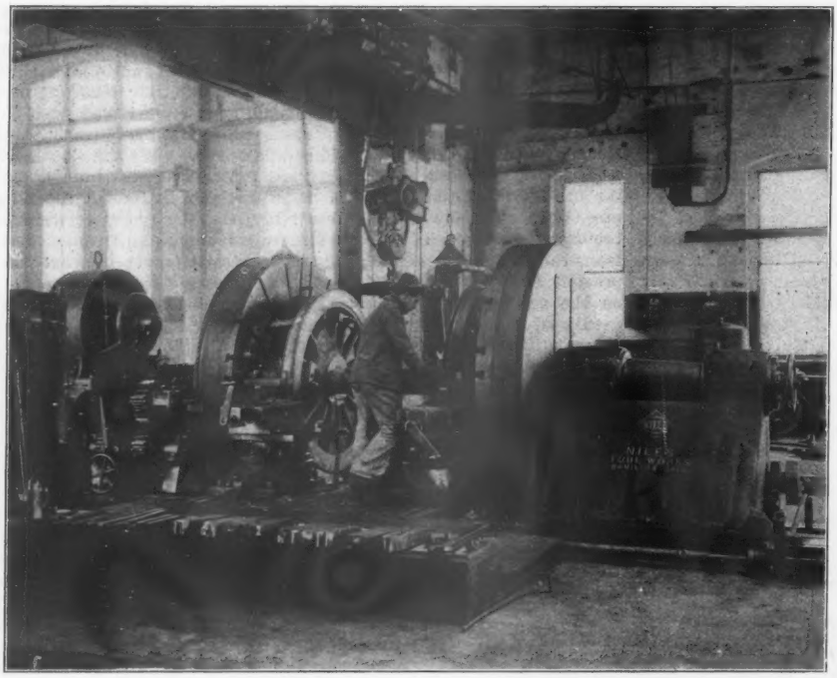

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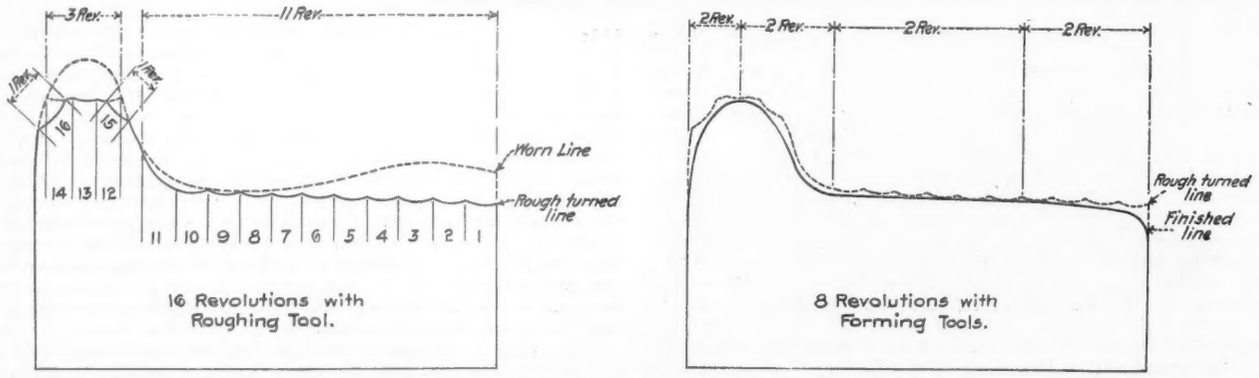

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64	12 1/4	15/32	9/16	3x1½	42	8	50
64	10 2/3	15/32	½	3x1½	50	8	58
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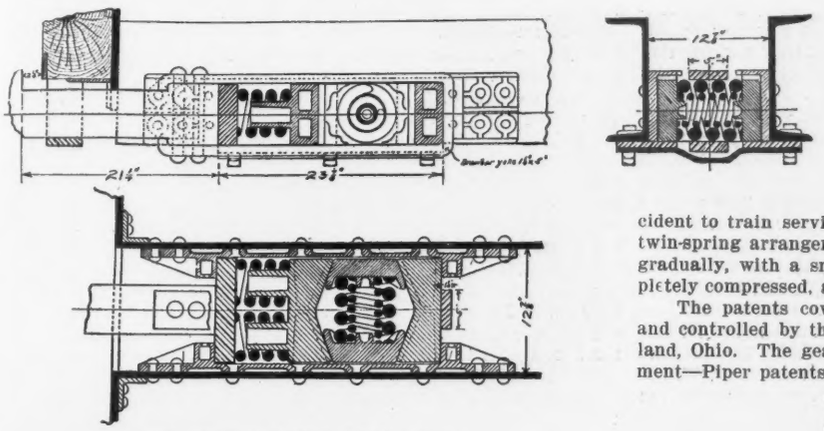

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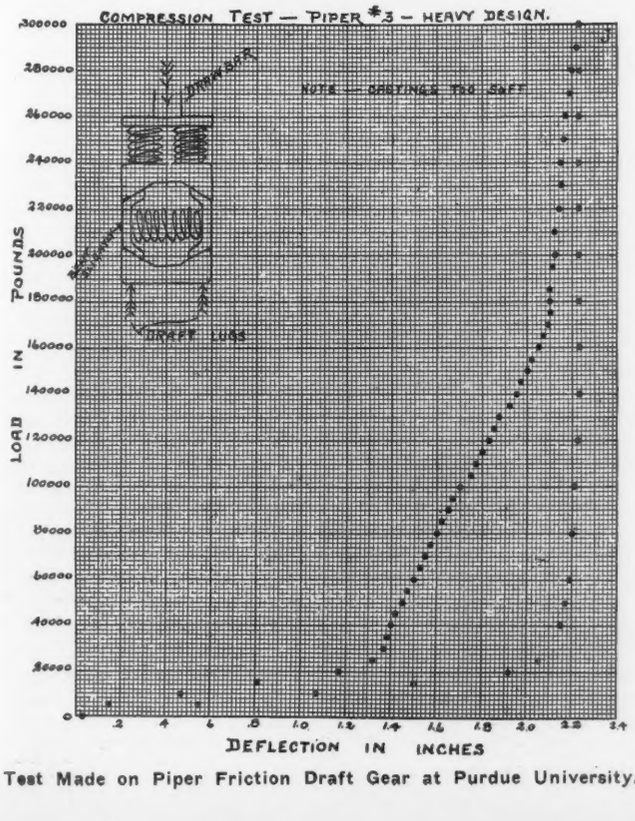

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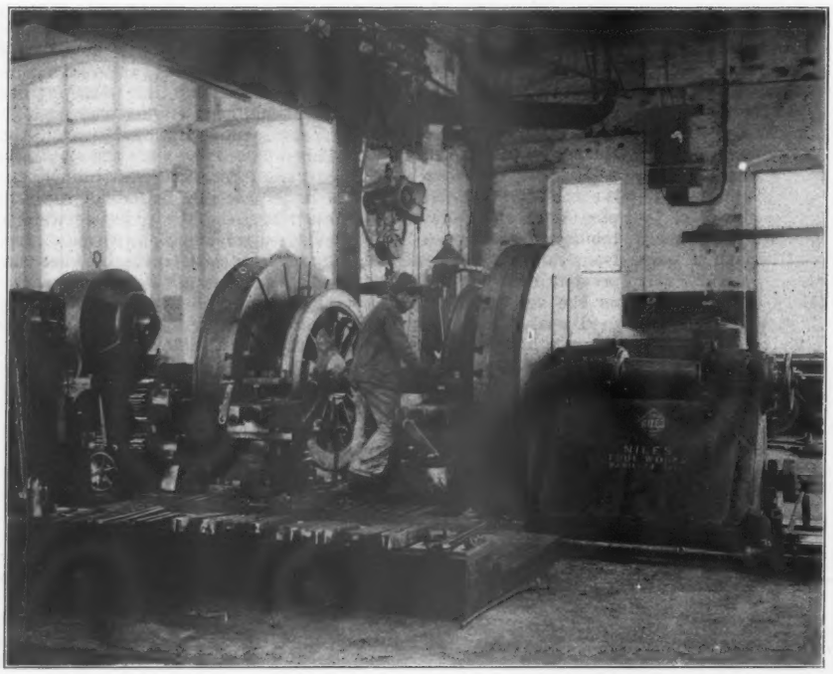

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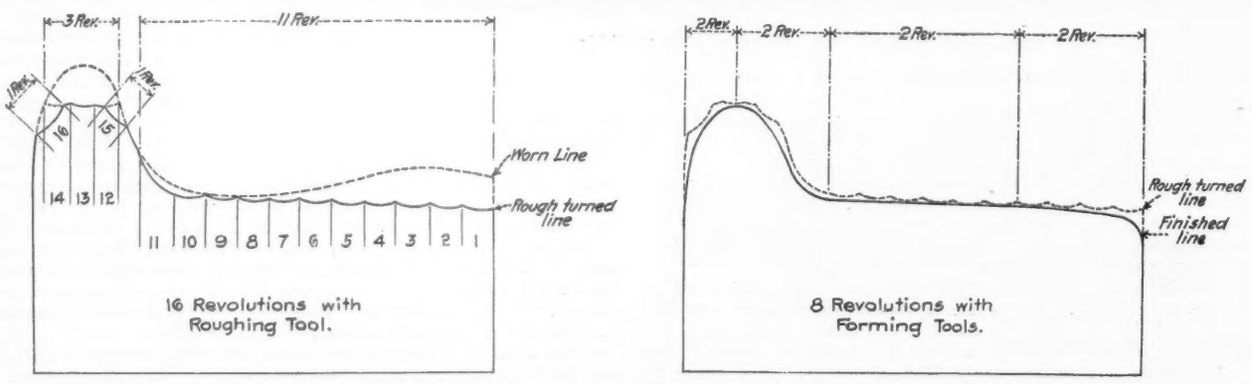

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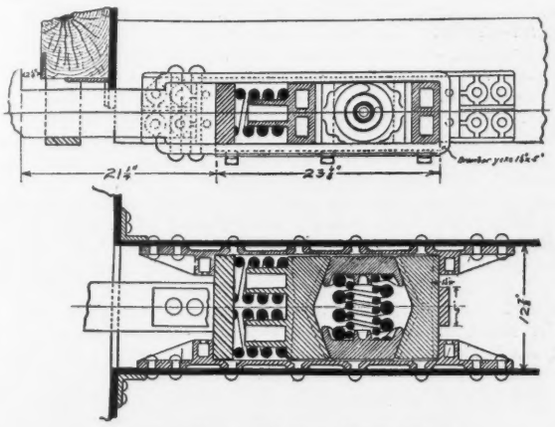

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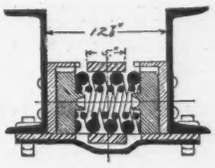

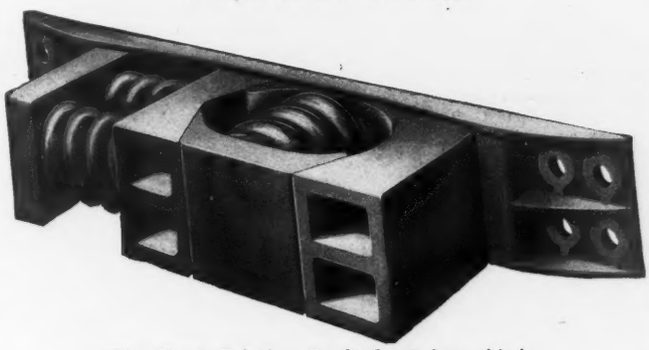

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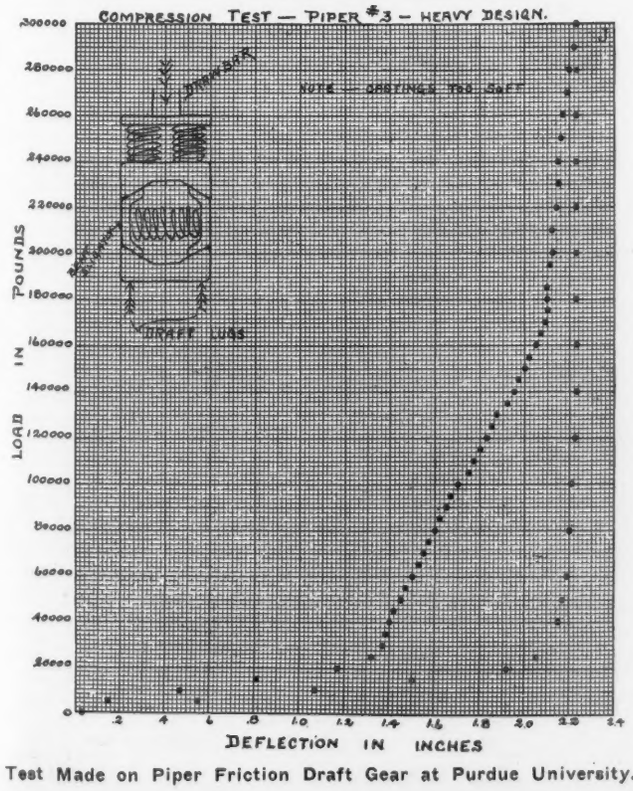

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For instance, take the operating head, however he may be

termed, General Manager, General Superintendent, or other, where will you draw the line upon the blanks to bear his designation? If only those used by him, or by his authority, what can be done with the many strictly operating blanks but entirely distinct from the head official? If all operating blanks are given his particular designation then the number becomes so large as to be confusing, and it is hard to keep the number in true order.

Again, the different departments have similar demands in the way of forms and the separation of them according to departments leads to a needless duplication of blanks that is not economical.

All forms intended for like use should be brought into close juxtaposition. This will facilitate the arranging of stock in the supply department; lessen the labor of picking up to fill requisitions; prevent duplications and printing unnecessary forms; permit of a more orderly arrangement of samples so that they can be more readily found and kept track of; and assist in making and maintaining a proper index.

Two good methods have been evolved by librarians for the proper classification and indexing of books and general knowledge. By the first of these the ten digits are used in making a general classification in ten parts, each of these parts is then divided into ten divisions by the use of a second series, and these in turn may be again subdivided, and so on indefinitely. By the second method the letters of the alphabet are used in the same manner, with the advantage that in place of having ten as the basis, with a multiple of tens, we have twenty-six as a basis with a multiple of twenty sixes. Taking the figures we readily see that the basis of ten for one digit makes 100 with two digits and 1,000 with three figures, while one letter gives 26, two letters 676, and three letters 17,576. The first gives us a total number of 1,110, the second a total of 18,278.

The use of letters assists the memory, and thus facilitates the ordering, naming and handling of same.

To illustrate: Assuming that the letter A represents any written understanding between two or more parties, then:

Ag may symbolize Agreements,
Ac " " Contracts,
Ar " " Releases.

Making the second subdivision we may have:

Aga Agreements touching Right of way.
Agb " " Baggage,
Agc " " Cars,
Agd " " Damages.
Aca Contracts touching Right of way.
Acb " " Baggage,
Acc " " Cars.
Ara Releases account Accidents,
Arb " " Baggage,
Arc " " Customs,
Ard " " Dogs, or live stock,
Are " " Employees' transportation.
Arf " " Freight.

Should there be more than one blank for any or all of the above forms they would be numbered consecutively as put into service; any excessive numbering would indicate at once a redundancy of forms, which would call for attention.

To keep a proper record and file of forms, a vertical file should be provided, with folders bearing the symbols arranged in exact alphabetical order, into which should be placed a sample of each form. Each folder may have printed upon it a form requiring the insertion of the following information:

Quantity; Invoice Date; Printed by; Remarks; Price. Or, this could be printed upon a separate sheet and attached to the sample in the folder; or a card index could be made to keep it in more accessible form.

If found necessary, although it will add an element of complexity, a series of numbers could be arranged to symbolize the authority who ordered the form, as for instance:

0 President.
1 First Vice-President.
2 Second Vice-President.
3 Third Vice-President.
4 Fourth Vice-President.
10 Comptroller.
11 Auditor.
12 Treasurer.
20 General Manager.

Then 1Aga may be the First Vice-President's agreement to permit the placing of a pipe underneath the track.

In order to make the system perfectly plain to all there should be printed a complete list of the symbols, with their application so far as has been made, leaving blank for future use those that have not been applied.

To properly install such a system will require expert knowledge of classification and indexing, but once established the most ordinary mind need not go astray in its application.

While this system can be worked by the stationery or other department, yet much better results will be attained by having a Supervisor of Forms. Such supervisor should have no authority to institute or abolish forms; yet if the right man is selected he may effect much economy. A good supervisor will be in receptive touch with the authorities who devise and authorize forms, on the one hand, and with those who use them, on the other. From the latter he will secure suggestions for improvements in forms, and these he will take up with the former; and those that are valuable will be adopted. Having all forms approved by him would insure the correctness of the printer's proofs and product, would prevent wrong copy being used and assure the correct symbolizing of forms. Having such a focus gives the opportunity to properly file, not only the form itself, but all variations and correspondence regarding it.

The establishment of such a head affords:

First—An opportunity for suggestions of improvements, so that the existing forms may be gradually improved until they become the best that the combined experience of the users may evolve.

Second—A central authority to which all forms would come, so that all needless, exceptional, duplicate and obsolete forms would be eliminated.

Third—A means for holding true to form and symbol and prevents confusion in the system.

In the matter of ordering supplies upon requisitions vised and approved by various officials, there is great waste. To have the subordinate make his requisition for a month's supplies upon one sheet, and that sheet to pass successively through the hands of four or five of his superiors is wasteful of time and effort, and leads to perfunctory work that becomes expensive. The better way is to fix a standard of supply of each article for each ordering unit, this standard to be fixed low rather than high, and after this standard is fixed and approved, orders to go directly from the unit to the supply source and be filled; in case additional supplies, or additions become necessary an application for them should go the required rounds for approval.

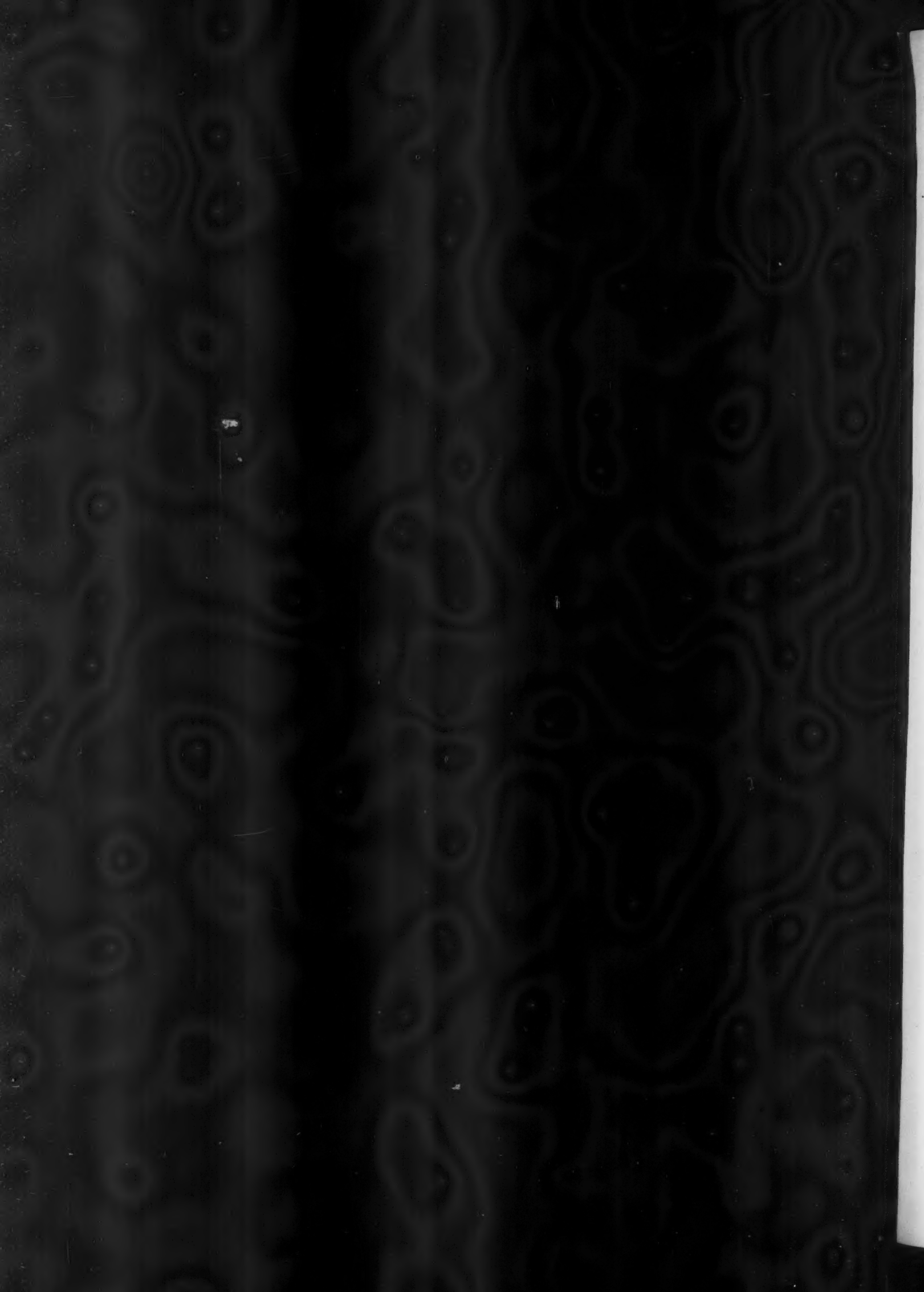
In this way the valuable time of officials will not be wasted upon useless detail, nor will it be necessary to turn over to inexperienced clerks this important matter. Nor will the approval become so perfunctory as to make it possible for an agent to order, upon a stationery requisition, a new freight house and office, and have it receive the approval of four different officials and reach the department for supplying, as has been known to have occurred under the system of many approvals upon each single requisition.

Mr. Stickney on Rate Legislation.

President A. B. Stickney, of the Chicago Great Western, made an address at the annual banquet of the Chicago Real Estate Board last week and again said some spicy things about rate regulation. The following partial report of Mr. Stickney's remarks is taken from the *Chicago Tribune*:

The railroads have not been altogether to blame for the rebates. Attention is called to the evident fact that no railroad can commit the rebate crime alone. It takes at least two, the shipper as well the railroad. Experience has proved that, until the universal railroad monopoly shall be effected by consolidation into two or three, or perhaps one huge corporation, the large shippers at competitive points have irresistible power to get lower rates than small shippers. Also that under present conditions, without effective support from the law, railroads are powerless to prevent rebates and kindred devices. There is no question but that, as long as rebates exist, no manufacturing or mercantile business is safe. It is a notorious and undisputed fact that most of the great trade monopolies of this country are founded and sustained by the rebate in connection with the protective tariff, which has, in effect, taxed the people hundreds of millions of dollars, not to produce revenue for the government, but to enrich trade monopolies. It is my conclusion that, because the railroads have assumed the common law obligation of common carriers, and because they are public highways, it is fair and right to control their rates by law, and that, because railroads are monopolies, the law of self-preservation, as well as of fairness and justice, demands that the people, through the government, should control railroad rates by law. Such laws, however, to be effective, must be fair and just and intelligently directed to substantial facts, which are the basis of reasonable rates. The country is indebted to Theodore Roosevelt for his courageous course in regard to legislative control of rates. He has recommended that whenever the reasonableness of any rate is challenged, the legislative commission, after full investigation, shall have the power to determine and put in force a rate which the commission shall deem just and reasonable. And if this principle is incorporated in the bill, it will be an assertion on the part of Congress of its right to fix all railroad rates. Such a law would be immensely valuable, because it would be a precedent in future legislation, when the whole problem shall come intelligently before Congress in the final contest which will, sooner or later, come.

Congressional committees and the interstate commission have produced a surfeit of expert opinions by expert witnesses, and I submit that the time has come when Congress should provide a commission to investigate actual facts and by systematic arrangement and consideration discover the principles of reasonable railroad rates.



GENERAL NEWS SECTION

NOTES.

Mr. F. A. Delano, President of the Wabash, has been elected President of the Union League Club of Chicago.

In the United States Court for the Eastern District of Virginia the President of the Suffolk & Carolina has been indicted for giving illegal rebates on freight.

Press despatches from Boston say that the Boston & Maine has increased the pay of 20,000 employees by percentages varying from 10 per cent. to 15 per cent., and that the total increased annual expenditure will be $1,825,000.

Mr. Henry M. Flagler, President of the Florida East Coast Railway, is to build at St. Augustine a handsome building for the Young Men's Christian Association connected with the road. The building will be 180 ft. by 200 ft., three stories high.

A press despatch from Tacoma, Wash., says that the Northern Pacific has paid six fines of $100 each for violation of the Safety Appliance law. Four offences were running defective coupling apparatus, and two were the running of locomotives with drawbars which were higher or lower than the legal height.

According to a Chicago reporter, one railroad president in that city says that he has tried in vain to find 3,000 men for work on new construction in the Northwest. He says that the railroads are offering from $1.75 to $2.50 a day without attracting workmen. Not for twenty-five years has he known labor to be so scarce.

The running of an "educational train" by the Illinois Central to teach the farmers of Illinois how to raise corn was noticed in a recent issue of the *Railroad Gazette*. The Chicago, Milwaukee & St. Paul is going to do a similar service for the wheat raisers of Minnesota, Iowa and South Dakota, and arrangements have been made for starting a train with lecturers from Chicago on February 2.

By the completion of the Indiana Harbor Railroad from Indiana Harbor, Ind., on the Lake Shore & Michigan Southern, southward to Danville, Ill., where connection is made with the Cleveland, Cincinnati, Chicago & St. Louis, the "New York Central Lines" are now enabled to run through passenger trains between Chicago and Cairo, Ill., and a night express with sleeping cars has already been put on. The southbound train leaves Chicago at 8:15 p. m. and reaches Harrisburg, Ill., 70 miles north of Cairo, at 9 a. m.

A car record office for the Pittsburg district has been established by the Pennsylvania lines, east and west of that city, and it will be under the direction of Edward Pitcairn, Freight Train Master of the Pittsburg division of the Pennsylvania Railroad. The purpose is to combine the records of the different division superintendents' offices, which control freight terminals in and near that city, and save the labor and delay of sending to the head car record offices of the several roads when information is needed concerning cars.

A Montreal paper prints a fac simile of a ticket for a passage around the world, and it is all on one card 2¼ in. by 4½ in., with no coupons. This remarkable ticket has been issued by the Canadian Pacific, and it is Form 4130. It reads from Montreal to Montreal by way of St. John (N. B.), Liverpool, Cape Town, Singapore, Hong Kong, Yokohama and Vancouver. The passenger goes by Canadian Pacific Railway trains or ocean steamships all the way. This will be a fine advertisement for the passenger department of the road, but the cynical reader will wonder how many tickets of this kind have been or will be sold. Thus far it appears that two have been used, but the fact that one of the passengers was the son of Sir Thomas G. Shaughnessy, President of the road, raises a suspicion that perhaps full rates were not paid. Another reason for doubting whether it will be necessary to print a very large supply of this form is the fact that the C. P. R. steamer (the Monteagle), which is to carry these two passengers from Liverpool to Hong Kong, is making this trip because another vessel is needed in the Pacific trade; she is not likely to serve as a common carrier for future aspirants for the distinction of going around the world on one ticket. It is proposed to sail around the Cape of Good Hope, so the total distance to be traversed by the two passengers will be 29,112 miles, as follows:

Montreal to St. John, N. B. (C. P. R. train)	481	miles.
St. John, N. B., to Liverpool (C. P. R. steamship)	3,224	"
Liverpool to Hong Kong (C. P. R. steamship)	15,249	"
Hong Kong to Vancouver (C. P. R. steamship)	7,254	"
Vancouver to Montreal (C. P. R. train)	2,904	"
Total	29,112	miles.

Rates on Cotton Piece Goods to Denver.

The Interstate Commerce Commission, in opinions by Commissioner Clements, has announced its decisions in cases against the Boston & Albany and the New York, New Haven & Hartford and others. In the case against the Boston & Albany the Commission rules that the fact that a carload rating has been established on cotton piece goods from the east to Pacific Coast points because of water competition, and the fact that duck and denims have been given carload rates to Salt Lake City and Denver to encourage manufacturing industries at those points, while elsewhere throughout the country the rate on cotton piece goods is the same for any quantity, does not indicate that the action of the carriers in denying a carload rating on tickings, drills and sheetings to Denver is unlawful.

The carriers' rates per 100 lbs. on cotton piece goods in less than carloads from New York, Boston and other eastern points are $2.24 to Denver and $1.50 to San Francisco. The charge to Denver is a combination of rates from the point of shipment to the Mississippi river, Mississippi river to Missouri river, and Missouri river to Denver. From New York to Chicago, from Chicago to Denver, and from St. Louis to Denver for a long period of years cotton piece goods have been given rates substantially below the rates on first class articles, and throughout the United States greater or less differentials on cotton piece goods under first class have been maintained with one notable exception, namely, from Missouri river points to Denver. Transcontinental rates from eastern points to San Francisco are made in competition with water rates, and are in no sense a measure of the value of the service; but that situation does not justify the carriage of goods to San Francisco at a loss, thereby placing additional burdens on other traffic. The rate of $1.50 on cotton piece goods from the east to San Francisco, about 3,400 miles, is assumed to cover the actual cost of the service, and that rate for the 1,400 to 1,600 miles less distance to Denver, and saving the haul of that distance over mountain ranges where fuel and labor are counted more expensive, is found to be reasonable for the transportation from New York, Boston and other eastern points to Denver. Under the present combination rate to Denver no reduction from local charges is made on account of the through haul of 2,000 miles. Such application of combined local charges to a long distance shipment places a wrongful burden upon the shipper. The exaction of first class rates on cotton piece goods between Missouri river points and Denver in view of the long prevailing differentials in other parts of the country and other existing conditions is unjust and unreasonable. The Commission decides that the result of the excessive rates on cotton piece goods between the Missouri river and Denver, and the application of the full locals in making up the through combination rate from New York, Boston and other eastern points taking the same rates to Denver, is to make the through rate excessive, and that such through rate to Denver to be reasonable should not exceed $1.50 per 100 lbs.

The principles of the New York, New Haven & Hartford case are decided in the foregoing case. For reasons stated in the decision, reparation on the shipment involved in this case is denied.

United States Steel Earnings.

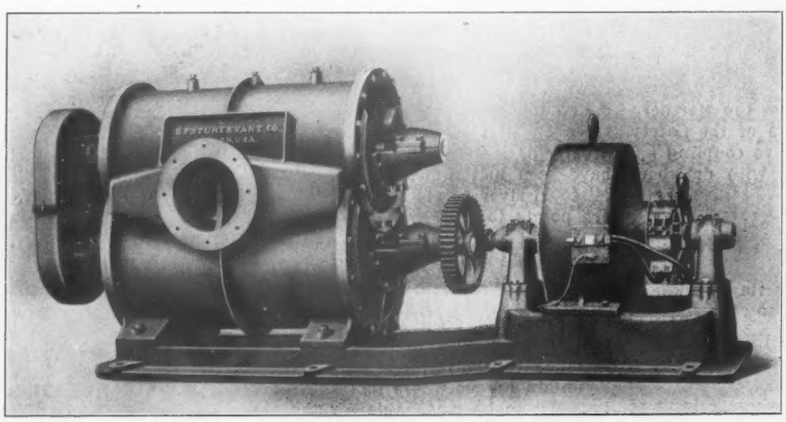
The net earnings of the United States Steel Corporation for the last quarter of 1905 were $35,278,688. This is about $4,000,000 greater than the figure for the previous quarter, and about $14,000,000 more than for the corresponding period in 1904. The net earnings for the entire year were about $120,000,000—$47,000,000 over 1904, when the earnings were the smallest in the history of the company, and $13,000,000 less then in 1902, which was the record year. The balance, after charges, in the last quarter of 1905 was $22,721,482, out of which was paid $6,304,919, the quarterly dividend of 1¾ per cent. of the preferred stock. This left a surplus of $16,416,563. From this sum $9,000,000 was appropriated for improvements and discharge of capital obligations, making the net surplus $7,416,563. The unfilled orders on hand on December 31 amounted to 7,605,086 tons, nearly 2,000,000 tons more than the highest corresponding figure in any previous quarterly statement.

Abolition of P. & R. Grade Crossings in Philadelphia.

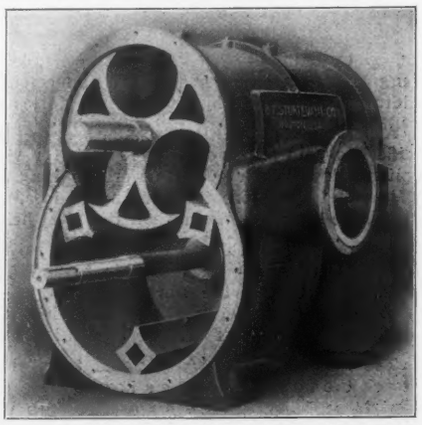
Announcement has been made that the plan for abolishing grade crossings on the New York division of the Philadelphia & Reading has been agreed upon by the railroad and the Philadelphia city authorities. The plans call for the elevation of the tracks from Spring Garden street, near the terminal, north through Ninth street, for a distance of about one mile, on an elevated steel structure. This is to a point just south of Columbia avenue station. Thence north the line will be on an earth embankment, crossing about ten streets on bridges, to Cumberland street. At this point the tracks will be depressed, reaching the low grade at the Huntingdon street station, and remain depressed passing Germantown Junction to about Seventeenth street, where they will again be raised, with a grade of 1.06 per cent., and continued on an elevated structure to Wayne Junction, crossing about seven streets on elevated structures.

The Sturtevant High-Pressure Blower.

The accompanying illustrations show a new high-pressure blower made by the B. F. Sturtevant Co., Boston, Mass. This blower is made in two types—in the horizontal, the two shafts lie in a horizontal plane, while in the vertical, one shaft is above the other. The blower consists of a cast-iron shell or housing in which are two rotating members or "rotors." One of these, the impeller, revolves in the larger portion of the casing which in the vertical type is the lower. It does the real work of compression. The other rotor, known as the idler, does no work; it successively provides spaces or chambers of proper shape at the desired points in the revolution, so that the impeller blades may return to the suction side of the blower without allowing the escape of compressed air. The idler or drum, revolving in the smaller part of the casing, which in the vertical type is above the impeller, is symmetrical and has a periphery nearly a complete circle. It consists of three hollow vanes or blades cast in one piece with the shaft, which is of cast-iron. The idler, revolving with large clearance, is turned at the same speed as the impeller by means of two spur gears.



The Sturtevant High-Pressure Blower, Vertical Type with Motor Drive.



Interior View of the Sturtevant High Pressure Blower.

The impeller, mounted on the driving shaft, is made up of three diamond-shaped bars or blades and a central web which is keyed to the steel shaft. Being symmetrical it is perfectly balanced at all speeds. As it revolves three separate pockets are formed in the annular space between the shell and a core extended lengthwise of the lower part of the casing. In reality the core is in two parts, each cast in one piece with the end plates, the space between them allowing the web to revolve. The ends of the cast-iron shell or casing, which consists of two hollow cylinders partially intersecting, are finished to receive the four cover plates in which are cast chambers or passages for lessening the noise, and increasing the efficiency of the machine. On either side of the housing are openings for the intake and the discharge of the air, flanged, and tapped for standard gas pipe fittings; the small sizes have openings at the sides, and the large blowers openings at the top and bottom. In every respect the casing and rotors are symmetrical, permitting the blower to run in either direction.

When it is desired to maintain absolutely constant pressure, the blower is provided with a relief valve, or automatic governor. For transferring gases and air at high-pressure, stuffing boxes are provided for the shafts, and a drain in the bottom removes tar and other distilled liquids.

The method of operation is as follows: Air at atmosphere pressure entering the blower at the intake is successively imprisoned in the three pockets formed by the three blades of the revolving impeller, and discharged at any desired pressure up to 10 lbs. per sq. in. The volume of free air delivered varies directly with the number of revolutions, the pressure varies with the resistance met in the delivery pipe. The principle upon which the blower operates is clearly shown by the accompanying diagrams which are sectional views of the rotors and casing. In the explanation it is assumed that the blower is running at a speed to produce average pressure, and that this pressure exists in the discharge outlet. While the rotating members were in the positions shown in Fig. 1, air entered freely and completely filled chambers X and D, while pockets E and Z were discharging air to the delivery pipe. From the previous movement of the rotors, the pressure in Y, filled with air carried over by the revolving idler, had been increased slightly by air flowing through the leakage passages N as will be explained later. The space between the blades A and C, just above the concave portion of the core, was practically filled by the wing of the idler, and consequently while in this position it took no part in the action.

While revolving from the position of Fig. 1 to that shown in Fig. 2, the air in pocket D has been carried along, and the communication between the chamber D and the inlet has been cut off. Space Z is filled with compressed air which further movement will carry toward the suction end, where it will flow back to the inlet and in escaping cause noise. But this loss and noise is prevented by the leakage chamber O which allows the pressure to be transmitted to the air in space Y, thereby increasing its density just before it is discharged.

Continued rotation carries the rotors to the position shown in Fig. 3; atmospheric air is now entering pocket F; the air in D is being carried around between the blades A and B in the annular space, and E is discharging. Above the impeller the remaining pressure in Z is being transmitted to the air in X by means of the leakage passage N provided for the purpose, thereby making its pressure a little greater than atmospheric. The air in space Y under slight pressure from previous leakage is imprisoned, and being carried around by the idler. When the fourth position is reached, pocket F will be filling, the pressure in chamber Z will have been reduced to atmospheric by leakage, space Y will discharge and a little compressed air from the delivery pipe will flow back through leakage passage M and increase the pressure in D, which will result in a quieter discharge when further movement brings B into the discharge passage.

The purpose and advantage of the leakage passages is now apparent; they make it possible to recover the pressure tending

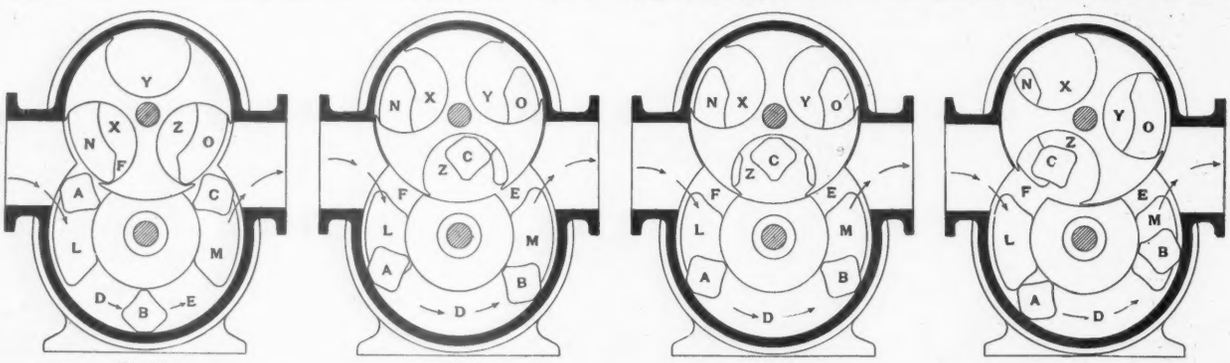


Fig. 1. Fig. 2. Fig. 3. Fig. 4.

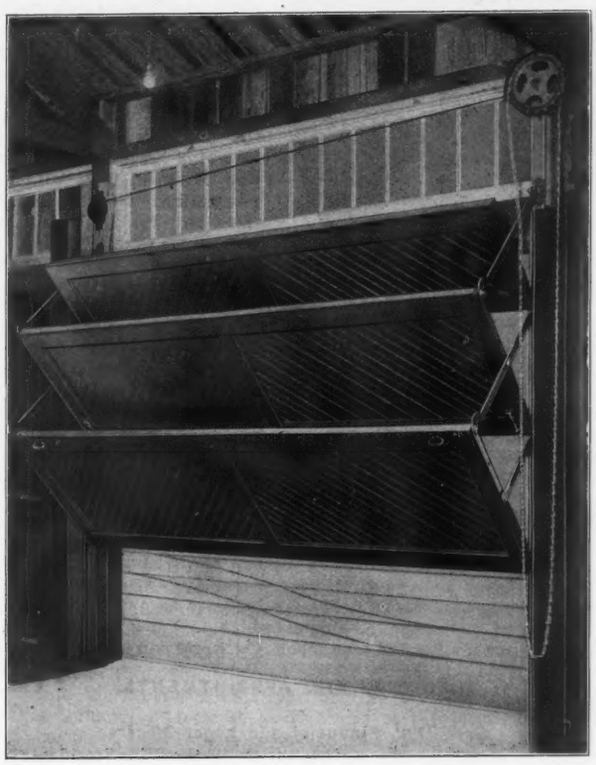
Diagrams Showing the Principle of Operation of the Sturtevant High Pressure Blower.

to escape from the impeller pockets and by making the increase in pressure gradual cause the blower to run with less noise. Leakage passage L has little effect when the blower runs in the direction shown here; it is made to allow the blower to be reversible.

It will be noticed that the impeller carries three blades, set at equal distances around the periphery, thus causing three admissions of air at each revolution. Upon leaving the position shown in Fig. 4 the rotors quickly reach a position in which the conditions are exactly the same as those shown in the first figure, the operation continuing as explained.

The Ritter Horizontal Folding Door.

The Ritter horizontal folding door shown in the accompanying illustration is a new design of door intended for use in freight houses, shops, warehouses and other places where a free and unrestricted door opening is required. The door is made in three horizontal panels extending the full width of the opening. The panels are attached to three steel bars on each side, forming a lazy-tong arrangement. The heels of the two lower bars slide on a vertical rail at the side of the door opening, while the inner end of the upper bar revolves on a fixed pivot. The lower corners of the bottom panel have lugs with rollers running on the vertical rails and the operating chains are attached to these lugs. The chains



Ritter Horizontal Folding Door.

pass over grooved sheaves fastened to the wall and have a counterweight suspended from the ends which moves up and down on the door post. The sheave on one side of the door has a toothed sprocket mounted on the same shaft, and this sprocket is driven by an endless chain as in an ordinary chain hoist. As the chain is operated the door is hauled up from the bottom as shown in the illustration. The three panels swing inward and upward, finally folding close together in a horizontal plane at the top of the door opening out of the way.

The doors can be made of wood, sheet iron, glass or concrete. The Terminal Warehouse Co., Kansas City, Mo., has recently ordered 73 doors to be made with steel frames and the panels filled with reinforced cinder concrete. The Cincinnati, Hamilton & Dayton has put in a number of wood panel doors in its new Gest street freight house in Cincinnati, and several will be used in the company's new shops at Ivorydale. The operating parts are simple and not easily damaged even though the door panels may be broken. As they are entirely under cover inside the house they will not freeze in winter. In summer the doors may be partly opened for ventilation and will stay in that position without fastening. When partly open the leaves act as louvres and shed the rain to the outside. This type of door has many advantages over swinging or sliding doors and is superior in some ways to the rolling lift door. It is made and sold by J. W. Walker, Lewis Block, Pittsburg, Pa.

Collision in Spite of Automatic Stop.

The British Board of Trade has encountered its first collision under automatic block signals, and it occurred on an electric railroad—a rear collision on November 7 near Mill Hill Park, on the Metropolitan District Railway of London. This was a slight collision, causing only two trifling injuries and no damage to the track. It occurred at about 9:30 p. m. during a dense fog. The report is by Major J. W. Pringle. The signals (Westinghouse electro-pneumatic) had been in use about six months. The signal which was passed has a train-stop apparatus, which did not effectively act. The train which wrongfully passed the signal was running very slowly (though not at the low speed of five miles an hour claimed by the motorman) and the motorman claims that he saw both the semaphore arm and the light, the arm down and the light green. The conductor, standing in the baggage compartment at the head of the train, confirms the statement of the motorman. But a signalman a short distance away has an illuminated diagram which automatically indicates the occupancy of track sections by trains, and he testifies that the signal was at stop. The arm is 30 ft. above the ground. Moreover, a trainman of the train went back after the collision, having to go only about 200 ft., and he climbed up the ladder and found both the arm and the light indicating danger. The inspector thinks, therefore, that the signal was at danger when the train passed it. As to the train stop, it appears that the trigger probably came in contact with the stop, but that it, or its attachment, was twisted on its axis so as to prevent it from fully opening the air-brake valve. There is no evidence to show how or when the brake trigger became twisted. It is quite possible, says Major Pringle, that the air valve was partially opened, but as the train was moving down grade and the motorman was occasionally applying the brake, he might not notice any small automatic application. Immediately after the collision the brake trigger was in position as though it had not been moved; but Major Pringle thinks that either it rebounded or that some person moved it back into the vertical position. In conclusion, Major Pringle says that the triggers should not be on the side frames of the cars, but should be attached directly to the axles; that there should be a second trigger on the train, both, perhaps, on the same car; and that when brakes are tested the examiners as well as the motorman should actually test the movement of the striking triggers by moving them until the air valves are fully opened.

A Week's Sales of Stock.

According to the *Wall Street Journal* in the week ending January 27 there were dealings in 19 stocks listed on the New York Stock Exchange to the extent of more than 100,000 shares each. Union Pacific headed this list with more than a million shares. Its outstanding capital is $190,213,900, and the sales of stock aggregated $109,529,000 par value. The following table shows the totals of shares for the week of the 19 companies, and the outstanding capital stock:

Stock.	No. of shares—Sales, week ended Jan. 27.	No. of shares—Stock outstanding.
American Locomotive	145,950	250,000
American Smelting & Refining	152,500	500,000
Anaconda Copper	296,600	75,000
Atchison, Topeka & Santa Fe	114,025	1,020,000
Brooklyn Rapid Transit	340,235	450,000
Chesapeake & Ohio	126,800	627,937
Chicago, Milwaukee & St. Paul	183,310	581,839
Colorado Fuel & Iron	327,610	301,000
Denver & Rio Grande	154,150	380,000
Erie	130,800	1,123,789
Norfolk & Western	162,425	660,000
Pennsylvania R. R.	367,700	3,027,500
Reading	898,200	700,000
Southern Pacific	452,300	1,978,492
Southern Ry.	400,400	1,199,000
Union Pacific	1,095,290	1,902,139
U. S. Steel com	450,950	5,084,952
U. S. Steel pf	163,321	3,603,141
Wabash	118,620	380,000

On Tuesday, January 30, total sales of stocks on the Exchange were 2,023,810 shares.

Pass Gossip.

It is not such a very unusual sight to see well dressed persons flash one of those new white annual passes at the ticket examiners of the Pennsylvania Railroad as they pass through the gates of the Jersey City station. There are few, if any, trip passes being flashed, but still there are quite some annuals. No one so far has seen the number of President Cassatt's pass, and the boys say they heard that the "old man" and his son, R. K. Cassatt, are each paying their fare like gentlemen in order to show a good example to the army of grafters who have had "cards." The same care is being given to the pass question as would generally occupy the official mind when a great bridge was being constructed over a broad and swift flowing river. The Reading has issued an order to employees riding on passes that they must vacate their seats to persons holding tickets. These surely are strenuous times, from a railroad pass standpoint, and hundreds of people are guessing who never guessed before.—*Jersey City Evening Journal.*

The new Pennsylvania rules prohibit the giving of passes to wives and children of deceased employees, which has been in practice for many years and has been helpful to many widows and

orphans, some of whose breadwinners have been killed while performing their duties. Pensioned railroad men will rank, as heretofore, with the employees as far as free transportation is concerned.—*Corning Leader.*

It is stated that the strong lines, some of them at least, are distributing passes to get contracts for the coming season. Even without the open rupture between the big and little railroads of Chicago, putting the anti-pass legislation out of business, it is now apparent that the same end would have been reached sooner or later through natural causes, as it is asserted positively that passes have been issued to big shippers, especially coal operators. The operators have been short of cars for the last year, and it is stated that promises of passes have been made and that big contracts for carrying coal have been placed since the first of the year. In addition there is a current report that several prominent politicians have received their passes on schedule time, but it is understood that the annuals are not to be delivered as promiscuously as heretofore, and each railroad has suspicions of the others.—*Indianapolis Star.*

Manufacturing and Business.

The Pedrick & Ayer Company, Plainfield, N. J., maker of portable tools, has been bought and will be operated by the Railway Appliances Company, of Chicago.

The American Steel Dredge Works, which was organized by James P. Karr and John D. Rauch, now has its complete plant at Logansport, Indiana, in operation.

The Delaware, Lackawanna & Western recently ordered from the Sprague Electric Co., New York, a motor equipment for driving the heating and ventilating apparatus at its Hoboken terminal.

The Abner Doble Company, of San Francisco, has opened a branch office in Los Angeles, Cal., at 447 Pacific Electric building. The company's business in the water wheel and machinery supply line had increased to such an extent that it became necessary to have better representation in the southwest. The new branch will have for its field southern California, Arizona and New Mexico and parts of Nevada and Mexico. Mr. L. Cummins will have charge of the office.

Richard L. Thomas, for some years connected with the National Lock Washer Co., of Newark, N. J., and now Second Vice-President of B. M. Jones & Co., Inc., Boston, Mass., with office at 143 Liberty street, New York City, has severed his connection with the former concern. Mr. Thomas for some time represented both the National Lock Washer Co. and B. M. Jones & Co., but owing to increased duties in connection with the new corporation of B. M. Jones & Co., Inc., Mr. Thomas has found it necessary to give all of his time to the latter concern.

What is said to be the largest order ever given for oil engines has recently been awarded to the De La Vergne Machine Co., New York, by Burnham, Williams & Co. (Baldwin Locomotive Works), Philadelphia, Pa. This is for engines aggregating over 3,300 actual h.p. Some of these are to be installed in the company's Philadelphia works, and the remainder at its steel works at Burnham, Pa. The installation will consist of 125 and 250 h.p. "Hornsby-Akroyd" oil engines, and they are to be used for direct connection to electric generators and to air compressors, while others will be used for operating machine tools by belt.

Mr. W. G. Hovey, the representative in New York City of the General Railway Signal Co., has been appointed Construction Manager of the company, and a new commercial agent will be appointed. The enormous amount of work to be done in connection with the signaling of the electrified lines of the New York Central, and the intricate problems involved in the work have evidently imposed on the signal company the necessity of making this use of Mr. Hovey's unusual ability and experience. Mr. Hovey was born in Maine in 1860, and entered railroad service in 1889 on the New York, New Haven & Hartford. In 1890 he went to the Hall Signal Company, and in 1892 to the Chicago & North-Western as Superintendent of Signals. In 1900 he left the railroad service to become Superintendent of the shops of the Taylor Signal Co., now merged in the General Railway Signal Company, and on the consolidation of the Taylor and Pneumatic Signal Companies in the G. R. S. Company, he was sent to New York.

Iron and Steel.

The Missouri, Kansas & Texas has given an order for 1,200 tons of bridge steel. Negotiations are pending for 100,000 tons of steel for railroad and building construction work. Contracts will soon be let for 60,000 tons of fabricated and structural steel for the new Manhattan bridge, the former award having been canceled by the Supreme Court.

The Atikokan Ore Company, which has a capital of $2,000,000, is planning to put up large blast furnaces at Port Arthur, Ont. Contracts for the steel structural work and machinery have been let to the Canada Foundry Company, of Toronto; the Canada Bridge Company; the Caledonia Iron Works, of Montreal, and to concerns in the United States.

It is stated that the United States Steel Corporation has been given one of the largest contracts ever let in this country for rails for shipment abroad. The contract is for 20,000 tons of rails for the Rio de Janeiro Tramway Light & Power Company. This company is capitalized at $25,000,000, and proposes to build 200 miles of electric railroad in the Brazilian Capital. The existing mule lines, about 125 miles long, have already been bought, and the work of converting the roads will begin immediately. Among the directors and officers of the company are Sir William Van Horne, William L. Bull and F. S. Pearson.

OBITUARY NOTICES.

Mr. Marshal L. Bacon, Auditor of the New York Central & Hudson River Railroad, died on January 28, in New York City, after an operation for appendicitis. Mr. Bacon was 43 years old. His whole railroad service had been with the New York Central. He began as office boy in the General Superintendent's office, and later was transferred to the Treasurer's office at the time when the Treasurer's duties included many of those of the present Accounting Department. When, in 1889, the Accounting Department was created, he was transferred from the Treasurer's office, later becoming Assistant Comptroller. Early in 1903, with the reorganization of the department and the discontinuance of the office of Comptroller he was made Auditor of the New York Central and subsidiary lines, with supervision over disbursements, freight, passenger and general accounts. Under his administration the scope of the Accounting Department has been greatly broadened. Mr. Bacon was a man, to whom, outside of his immediate duties, responsibilities were delegated as a matter of course. He was Treasurer of the Transportation Club and of the Railroad Young Men's Christian Association. He was also a Railroad Branch Representative on the State Executive Committee of the latter organization. At his home, Tarrytown, he was always a leader in efforts of benevolence and public benefit. As a man, Mr. Bacon inspired to an exceptional degree the love and admiration of his associates of every rank. To the interest and friendly advice which he always found time to give, many a man to-day owes the foundation of a successful career. His death comes as a personal sorrow to those who have been fortunate enough to know and work with him. He was the kind of man whom the world can ill afford to lose.

Marshal L. Bacon.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Chicago & North-Western.—The duties of the Vice-Presidents are now defined as follows: H. R. McCullough in charge of freight and passenger traffic; M. M. Kirkman in charge of auditing in connection with operation and proprietary interests; J. M. Whitman in charge of new construction, the operation of coal companies and the maintenance of bridge companies, and W. A. Gardner, hitherto General Manager, has been elected Vice-President in charge of operation and maintenance. Mr. Gardner began railroad work in 1872 as telegraph operator on the Chicago & Alton. In 1878 he went to the North-Western as Clerk and Operator in the office of the Superintendent, remaining there until 1885, when he was made Assistant Superintendent of the Wisconsin division. Five years later he became Superintend-

W. A. Gardner.

ent of the same division, and in 1896 was appointed Assistant General Superintendent. In 1899 he was appointed General Manager, where he has remained until his present promotion.

New York Central & Hudson River.—R. A. White, Auditor of Disbursements, has been appointed Auditor, succeeding M. L. Bacon, deceased. C. H. Chambers, Assistant Auditor of Disbursements, succeeds Mr. White.

Operating Officers.

Chicago & North-Western.—Richard H. Aishton, Assistant General Manager of the lines east of the Missouri river, has been appointed General Manager, succeeding W. A. Gardner, promoted. Mr. Aishton's first railroad service was in 1878, in an engineering corps of the Chicago & North-Western. He later became Assistant Engineer, then Superintendent of Bridges and Buildings, and afterward Division Engineer. In 1895 he was appointed Assistant Superintendent, and two years later was made Division Superintendent. In 1891 he was appointed General Superintendent, and in 1902 was promoted to be Assistant General Manager, which position he has held until his present appointment. W. D. Cantillon, General Superintendent of the lines east of the Missouri river, has been appointed Assistant General Manager, with office at Chicago, Ill., succeeding Mr. Aishton. W. E. Morse, Superintendent at Baraboo, Wis., succeeds Mr. Cantillon, with office at Chicago. W. D. Beck has been appointed Superintendent of the Madison Division, with office at Chicago, Ill., succeeding Mr. Morse; E. G. Schevenell has been appointed Superintendent of the Minnesota division, succeeding Mr. Beck; F. H. Hamill has been appointed Superintendent of the Sioux City division, succeeding Mr. Shevenell; A. F. Reiner, Trainmaster at Boone, Iowa, has been appointed Assistant Superintendent of the Madison division, succeeding Mr. Hamill.

R. H. Aishton.

Indiana Harbor.—Frank Beckwith, who was recently appointed General Superintendent of this road, graduated in 1892 from the Civil Engineering Department of the University of Illinois. Before that time he had worked on surveys and construction work for the United States Government, for the Colorado Railway, and for the Missouri Pacific. After graduation he went into the Engineering Department of the Chicago, Burlington & Quincy, and rose to be Engineer of the Iowa Lines of that company. In 1903 he went to the Lake Shore & Michigan Southern as Bridge Engineer, and was promoted to Principal Assistant Engineer of the same road.

Lake Erie & Western.—W. J. Davis, Superintendent at Muncie, Ind., has been appointed Superintendent of the Peoria division, succeeding F. T. Bowles, resigned.

Missouri Pacific.—J. W. Dean, Superintendent of Little Rock Terminals, has been appointed Superintendent of the Central division, with office at Van Buren, Ark., succeeding J. F. Harnit, resigned. H. L. Hungerford succeeds Mr. Dean, with office at Argenta, Ark. F. W. Green, Superintendent of the Arkansas division, has been appointed Superintendent of the Memphis division, with office at Wynne, Ark. A. J. Alexander, Superintendent of the Illinois division, succeeds Mr. Green, with office at Little Rock, Ark. B. G. Fallis succeeds Mr. Alexander with office at Chester, Ill.

Pittsburg & Lake Erie.—J. B. Yohe, General Superintendent, has been appointed General Manager.

Traffic Officers.

Atlantic & North Carolina.—The authority of H. C. Hudgins, Freight and Passenger Agent of the Norfolk & Southern, has been extended over the A. & N. C.

Chicago, Cincinnati & Louisville.—T. H. Gurney, formerly Chief Clerk to the General Passenger Agent of the Cincinnati, Hamilton & Dayton, has been appointed General Passenger Agent of the C., C. & L.

Mexican Central.—J. C. McDonald has been appointed Assistant General Passenger Agent at Mexico City, succeeding W. K. MacDougald, resigned.

Engineering and Rolling Stock Officers.

New York Central & Hudson River.—Francis Boardman has been appointed Division Engineer of the Electric division, with office at New York. Mr. Boardman has been for a short time Designing Engineer, previous to which he was Assistant Engineer in the Maintenance of Way department. He graduated from the Academic Department of Yale University in 1897, and afterwards took a post-graduate course in the School of Mines at Columbia.

New York, Chicago & St. Louis.—E. E. Hart, Engineer, has been appointed Chief Engineer.

Pennsylvania Lines West.—W. R. Hillary, Assistant Engineer, at Fort Wayne, Ind., has been transferred to the same position at Newcastle, Pa., succeeding A. W. Grosvenor, who succeeds Mr. Hillary, at Fort Wayne.

Pittsburg & Lake Erie.—The authority of J. F. Deems, General Superintendent of Motive Power of the New York Central & Hudson River, has been extended over the P. & L. E.

LOCOMOTIVE BUILDING.

The Intercolonial will build four locomotives in its Moncton shops.

The Alaska Central will shortly be in the market for one 70-ton locomotive.

The Chicago Junction has ordered five switching locomotives from the American Locomotive Co.

The Missouri, Kansas & Texas is reported to have ordered 20 mogul, 10 passenger and five switching locomotives from the Baldwin Locomotive Co.

The Duluth, Rainy Lake & Winnipeg, formerly the Duluth, Virginia & Rainy Lake, has, it is reported, ordered eight locomotives. W. H. Cook, President, Duluth, Minn.

The Chesapeake & Ohio has ordered one switching locomotive from the American Locomotive Co., and one additional 150-ton Shay locomotive from the Lima Locomotive & Machine Co.

The Chicago & Eastern Illinois has ordered 30 consolidation and four six-wheel switching locomotives from the Baldwin Locomotive Co. The specifications for the consolidation locomotives are exactly the same as for the last 28 consolidation locomotives reported in our issue of January 15. The specifications for the switching locomotives are exactly the same as for the 10 switching locomotives reported in our issue of December 15.

The Evansville & Terre Haute, as reported in our issue of January 26, has ordered six consolidation (2-8-0) and two six-wheel switching locomotives from the Baldwin Locomotive Co. The consolidation locomotives will weigh 182,500 lbs., with 160,000 lbs. on drivers; cylinders, 21 x 28 in.; diameter of drivers, 55 in.; straight boiler, with a working steam pressure of 200 lbs.; 268 tubes, 2¼ in. in diameter and 14 ft. 6 in. long; firebox, 101⅞ x 66⅞ in.; tank capacity, 7,500 gallons, and coal capacity, 12 tons. The switching locomotives will weigh 142,000 lbs.; cylinders, 20 x 26 in.; diameter of drivers, 50 in.; straight boiler, with a working steam pressure of 180 lbs.; 279 tubes, 2 in. in diameter and 15 ft. ⅝ in. long; firebox, 65⅛ x 62¼ in.; tank capacity, 5,000 gallons, and coal capacity, eight tons.

The Illinois Central, as reported in our issue of January 26, has ordered 40 simple consolidation and five simple Pacific locomotives from the American Locomotive Works, all for August and September delivery. The consolidation locomotives will weigh 203,500 lbs., with 181,000 lbs. on drivers; cylinders, 22 in. by 30 in.; diameter drivers, 63 in.; wagon top boilers; working steam pressure 200 lbs.; heating surface 2,946 sq. ft.; 344 tubes, 2 in. in diameter and 15 ft. 6 in. long; wide firebox, 107 in. by 67¼ in.; grate area, 50 sq. ft.; tank capacity, 7,000 gallons of water, and coal capacity, 15 tons. The Pacific type locomotives will weigh 224,000 lbs., with 140,500 lbs. on drivers; cylinders, 22½ in. by 26 in. diameter; drivers, 75 in.; straight boiler with a working steam pressure of 210 lbs.; heating surface, 3,332 sq. ft.; 302 tubes, 2 in. in diameter and 20 ft. long; wide firebox, 102 in. by 71⅞ in.; grate area, 51 sq. ft.; tank capacity, 7,000 gallons of water, and coal capacity, 15 tons.

The Kansas City Southern, as reported in our issue of January 26, has ordered 15 simple consolidation locomotives, from the American Locomotive Company. The locomotives will weigh 205,000 lbs., with 185,000 lbs. on drivers; cylinders, 22 in. by 30 in.; diameter of drivers, 55 in.; straight boiler with a working steam pressure of 200 lbs.; 380 Tyler charcoal iron tubes, 2 in. in diameter and 14 ft. 6 in. long; Otis steel firebox, 120 in. by 41 in.; tank capacity,

6,000 gallons of water, and coal capacity, 10 tons. The special equipment will include Westinghouse air-brakes, Taylor axles, Keasbey and Mattison Manufacturing Company's boiler lagging, Perfecto brake-shoes, Climax couplers, Handlan-Buck headlights, Ohio injectors, Sullivan piston and valve rod packings, Consolidated safety valves, Baltimore sanding devices, Chicago sight feed lubricators, Railway Steel-Spring Company's springs, Ashcroft steam gages and Midvale driving and truck wheel tires. Two of these locomotives are to be equipped with Allfree-Hubbell valve gear.

The New York Central Lines, as reported in a previous issue, have ordered 357 locomotives, from the American Locomotive Company, as follows: New York Central & Hudson River, 20 Atlantic type, for June and November delivery; 45 consolidation type, for September, October and December delivery; 20 combination passenger and freight locomotives, for December delivery, and 25 switching locomotives for December delivery. Lake Shore & Michigan Southern, 37 consolidated type, for February, September and December delivery; 10 Atlantic type, for December delivery, and three decapods and 25 switching locomotives for October and December delivery. Indiana Harbor, 25 consolidation and 15 switching locomotives. Cleveland, Cincinnati, Chicago & St. Louis, 50 consolidation locomotives, for February, September and December delivery; 10 Pacific type locomotives, for May delivery, and 20 switching locomotives, for September delivery. Michigan Central, 24 consolidation locomotives; 11 ten-wheel combination locomotives, for September and December delivery; eight Pacific type locomotives, for June delivery, and 10 switching locomotives, for December delivery.

CAR BUILDING.

The Boston & Maine has ordered six café cars from the Pullman Co.

The Pennsylvania has ordered 16 passenger cars from the Pullman Co.

The Georgia Southern & Florida is in the market for additional freight equipment.

The New York Central & Hudson River has ordered 55 electric cars from the St. Louis Car Co.

The Boston Elevated, it is reported, will shortly be in the market for 45 elevated and 37 surface cars.

The Colorado Midland is building additional equipment in its own shops, including three dining cars.

The Missouri, Kansas & Texas, it is reported, will shortly purchase additional baggage and passenger equipment.

The Illinois, Iowa & Minnesota has ordered 300 furniture cars and 200 box cars from the American Car & Foundry Co.

The Birmingham Railway Light & Power Co., Birmingham, Ala., is building a few cars at its own shops as a matter of experiment.

The Kanawha & West Virginia is in the market for 200 to 250 coal cars and for about 75 to 80 box cars, all of 80,000 lbs. capacity.

The Chicago & Alton, as reported in a previous issue, has ordered 200 refrigerator cars of 80,000 lbs. capacity from the American Car & Foundry Co.

The Minneapolis & St. Louis has ordered six first-class chair cars from the American Car & Foundry Co., for August delivery. These cars will be equipped with Pintsch light.

The Alaska Central will build at its Seward shops 35 Hart convertible coal and ballast cars of 80,000 lbs. capacity. Prices are also being asked for fifteen 60,000 lbs. capacity, 36-ft. flat cars.

The Norfolk & Western has ordered 1,000 gondolas of 100,000 lbs. capacity from the Western Steel Car Co., and 2,500 hopper cars of 100,000 lbs. capacity from the South Baltimore Steel Car & Foundry Co.

The Allis-Chalmers Company is having built at the West Milwaukee shops of the Chicago, Milwaukee & St. Paul two special steel flat cars of 100 tons capacity each. These cars will measure 41 ft. long and will be fitted with 16 wheels each.

The Syracuse Rapid Transit Company has ordered 10 semi-convertible cars from the Kuhlman Car Company, for May delivery. These cars are to be of wood and will measure 45 ft. long x 8 ft. 3 in. wide over all. They will be equipped with air-brakes.

The Oregon Railroad & Navigation, as reported in our issue of Jan. 19, has ordered 45 tank cars of 100,000 lbs. capacity (12,500 gallons) from the Pressed Steel Car Co. These cars will weigh 46,600 lbs., and measure 44 ft. 3¼ in. long, 9 ft. 8 in. wide, and 12 ft. 11⅛ in. high, over all. The special equipment includes: Simplex bolsters, Damascus brake-beams, Congdon-Christie steel back brake-shoes, Hewitt brasses, Climax couplers, Miner draft rigging, Railway Steel Spring Co.'s springs, and arch-bar type rigid trucks.

The Interborough Rapid Transit Company, New York, as reported in our issue of January 26, has ordered 12 steel cars from the Pressed Steel Car Company for May delivery. These cars will weigh 30,800 lbs., and will have a capacity of 28,000 lbs. each. They will measure 43 ft. 5 in. long x 8 ft. 4 in. wide x 3 ft. 11 in. high. The bodies and underframes will both be of steel. The special equipment will include the Standard Steel works axles, Pressed Steel Car Company's body bolsters, Interborough Rapid Transit Company's brake-beams, American Brake-Shoe & Foundry Company's brake-shoes, and Van Dorn couplers and draft rigging.

The Kansas City Southern is in the market for 1,000 coal cars of 80,000 lbs. capacity, 50 tank cars of 10,000 gallons capacity, and 10 cabooses. The coal cars will measure 39 ft. long, 9 ft. 6½ in. wide and 48 in. high, all inside measurements. The tank cars will measure 39 ft. long and 92½ in. wide, inside measurements. The cabooses will measure 27 ft. 5 in. long, 8 ft. 1 in. wide, and 11 ft. 2 in. high, inside measurements. The special equipment for all will include: Damascus brake-beams, Westinghouse air-brakes, Hewitt brasses, Climax couplers, Miner draft rigging, Harrison dust guards, McCord journal boxes for coal and tank cars, and Kansas City Southern journal boxes for cabooses, Kansas City Southern trucks for coal cars and cabooses, and arch-bar trucks for tank cars.

BRIDGE BUILDING.

Americus, Ga.—The commissioners will build a steel bridge, 192 ft. long, consisting of one span of 60 ft. and steel trestle work 132 ft. long, over Muckadee creek to replace the present Guerry bridge.

Arkansas.—A bill has been introduced in the Lower House of Congress authorizing the Campbell Lumber Co. to build a bridge over the St. Francis river, in Clay County, Ark.

Atlanta, Ga.—City Engineer R. M. Clayton expects to complete plans for the Washington street viaduct, so as to ask for bids for this proposed structure on February 17.

Fairburn, S. Dak.—Bids are wanted by the County Commissioners at Custer, April 3, for building a steel bridge 40 ft. long over French creek, in Custer County. W. A. Nevin is County Auditor.

Florida.—The bill authorizing a bridge over the navigable waters of St. Andrews Bay, in Florida, has been passed by the House of Representatives. (Jan. 26, p. 28.)

Fort Frances, Ont.—Application will be made to the government authorities for permission to build a combined highway and railroad bridge over Rainy river near Pithers' Point.

Fremont, Ohio.—The Lake Erie & Western, which has been planning for a long time to build a bridge over the Sandusky river, has agreed with the state authorities where it shall be located, and, it is said, will at once put up the new structure to cost $90,000.

New Haven, Conn.—The New York, New Haven & Hartford is having plans made and will soon ask for bids for a number of steel bridges.

Pennsylvania.—The Lower House of Congress has passed a bill extending the time for beginning construction of the bridge across the Monongahela river by the Counties of Washington and Westmoreland, Pa.

Tampico, Mex.—Plans are being made by the Mexican Central to build a drawbridge to cost about $500,000 over the Panuco river near this place.

Texas.—The bill authorizing the Jasper & Eastern Ry. Co. to build and operate a railroad bridge over the Sabin river, in Texas and Louisiana, has been passed by the House of Representatives. (Dec. 29, 1905, p. 207.)

Other Structures.

Corning, N. Y.—According to newspaper reports the Erie is planning to put up a new station here.

Harrisburg, Pa.—Announcement has been made that the Pennsylvania will begin work about April 1 on a new freight house 650 ft. long, to accommodate 175 cars; also a new brick office building three stories high, adjoining the freight house, at a cost of about $350,000 for both structures.

New York, N. Y.—Plans have been filed by the Pennsylvania with the building department, for its proposed mammoth passenger station to be built at Seventh and Eighth avenues and Thirty-first and Thirty-third streets. The building is to be 433.5 ft. wide north and south, and 771.6 ft. long on the streets, and will cost about $4,000,000.

Springfield, Ohio.—The Cleveland, Cincinnati, Chicago & St. Louis has plans ready for building car shops in this city.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

AMERICAN RAILROAD OF PORTO RICO.—This company, which operates 160 miles of road in Porto Rico, is building an additional 25 miles. August Duval, of San Juan, is Manager.

ASHEVILLE SOUTHERN (SOUTHERN RAILWAY).—An officer writes that this company, recently chartered in North Carolina, has been formed for the purpose of local development, in the interest of the Southern Railway. A. B. Andrews is President and W. H. Wells Engineer of Construction, Washington, D. C. (January 12, p. 13.)

BALTIMORE & OHIO.—This company, through the Schuylkill East Side Railroad, has bought 30 acres of land in Philadelphia, Pa., which will be used to increase the company's freight facilities.

BOSTON SUBWAYS.—The report submitted to the Massachusetts Legislature, by the Boston Rapid Transit Commission, for the future development of the subway system favors an extension to Copley Square, and suggests that a new line be built under Commonwealth avenue. A plan has been submitted for an east side subway, and two methods are suggested of reaching South Boston. The city authorities of Cambridge recently passed an order favorable to the company, authorizing negotiations for the building of a two-track subway from Craigie bridge, Cambridge, through Cambridge to Harvard Square, and from Cambridge street at Webster avenue to the Somerville line.

BROWNSVILLE, HIDALGO & NORTHERN.—This company has been incorporated in Texas, with a capital of $600,000, to build a railroad from Brownsville, Tex., to Houston, a distance of 330 miles, also a branch from a point on the main line about ten miles from the southern corner of Lavaca County, to San Antonio, an additional 90 miles; also a branch from a point six miles from Brownsville, through Hidalgo County for a distance of 50 miles, and a branch from a point three miles from Brownsville in an easterly direction to the northern side of the Brazos river, 25 miles, making a total distance of about 500 miles. The offices of the company will be at Brownsville. Uriah Lott is President; James A. Browne, Vice-President, and John D. Hill, Secretary.

CANADIAN MIDLAND.—Incorporation has been granted this company, in Oklahoma, with a capital of $40,000,000, to build a railroad from Kansas City to El Paso, Tex., passing through the counties of Pottawatomie, Cleveland, Comanche, Kiowa and Greer, in Oklahoma. The office of the company will be at Lawton. Incorporators include: G. R. Robertson, C. F. H. Barber, G. McPaschal, all of Lawton; Milfred Steele, of Chicago; I. B. Hampton, of Hampton, Ind. T.; A. S. McKennon, of Wekoka, Ind. T.; E. A. Hill, of Muskogee, and others.

CHATTANOOGA, ANDERSON & ATLANTIC.—Charters have been granted this company, in the states of Georgia and South Carolina, to build a railroad from Chattanooga, Tenn., east via Clayton, Ga., and Westminster and Anderson, S. C., to the seaboard at Charleston. Offices of the company will be opened in Chicago, Ill., and at Anderson, S. C. Albert R. Morton, Chicago, Ill., is President; Capt. P. K. McCully, Treasurer; J. E. Breazeale, Secretary; Mayor M. F. Whitner, of Anderson, S. C., General Counsel.

CHESTERFIELD & LANCASTER.—Contracts are reported being let by this company, which operates a line from Cheraw, S. C., to Ruby, a distance of 21 miles, for extending the road to Lancaster. The proposed route will be through a valuable timber region.

CHICAGO, KALAMAZOO & EASTERN (ELECTRIC).—Incorporation has been granted this company in Michigan with a capital stock of $250,000 to build an electric line from Kalamazoo to Paw Paw and Marcellus, a distance of about 30 miles. The incorporators are Fred F. Bennet, M. H. Lane, Frank H. Melham, Glenn L. Shipman, Victor L. Palmer, Frank B. Lay, of Kalamazoo, and George W. Greenway, of Grand Rapids.

CHICAGO, MILWAUKEE & ST. PAUL.—This company, it is said, is double-tracking its line from Milwaukee to La Crosse, and within a few months work will be commenced on double-tracking from the latter point northward. Grades will also be reduced and the lines straightened.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—Bids are wanted by William M. Duane, Superintendent, Cincinnati, Ohio, for grading and masonry work in connection with the double-tracking and relocation of the Cincinnati division of this road. The work calls for the removal of two million cubic yards of earth, divided into sections, ranging from 200,000 to 800,000 cubic yards, and for about 20,000 cubic yards of masonry work, as mentioned on advertising page 22.

COLUMBUS CITY & OCONEE.—Incorporation has been granted a company under this name in Georgia, with a capital of $100,000, to build a railroad from Columbus, Ga., to the Oconee river, a distance of 12 miles. The incorporators include L. F. Henson and others, of Felher County, and Uriah & Sears, of Montgomery County, and others.

CUBA RAILROAD.—This company is planning to build an extension from its main line at Cacocum, in the State of Santiago, north to Holguin, a distance of about 15 miles.

ERIE.—Announcement has been made by this company that it will double-track its lines from Carrollton, N. Y., to Cuba, a distance of 25 miles. This work will be done in connection with the low grade line being built from Cuba to Hunts, N. Y., on the Buffalo division.

GRAND TRUNK PACIFIC.—This company, it is said, is asking bids (February 20) to build the section of its proposed road from Touchwood Hills west to Edmonton, a distance of about 450 miles, and intends to have work begun as soon as the weather permits. The company has now under construction 210 miles from Lake Superior to the main line to the north, and 275 miles from Portage la Prairie to the Touchwood Hills west of Winnipeg.

GREEN RIVER VALLEY (LOUISVILLE & NASHVILLE).—This company, it is said, is planning to build a line from Scottsville, Allen County, Ky., to Stanford in Lincoln County. Contracts are to be let about April 1. This is supposed to be a Louisville & Nashville project.

GUANTANAMO.—This company is building 40 miles of railroad in Cuba. E. A. Brooks, of Santiago de Cuba, is President, and Richard Brooks, of Guantanamo, Chief Engineer.

INDIANAPOLIS & LOUISVILLE (ELECTRIC).—Incorporation has been granted this company, in Indiana, with a capital of $3,000,000, to build an electric road between Indianapolis and Louisville via Franklin, Edinburg, Columbus, Seymour, Crothersville, Scottsburg, Sellerburg, and Jeffersonville. The offices of the company will be at Indianapolis. The directors include: John E. Geeley, of Jefferson; S. A. Miller, of Indianapolis; Robert Candee, of Chicago, and others.

INTEROCEANIC.—This company, which belongs to the Mexican government system of railroads, is completing financial arrangements to secure funds to change its gage from narrow to standard. The road runs from Mexico City east to Vera Cruz. The cost of straightening the line and converting it will be about $6,000,000. An additional $2,000,000 will be spent for rebuilding and for new equipment.

LOUISVILLE & NASHVILLE.—Bids, it is reported, are to be opened by this company early in March for building a line from Williamsburg, Ky., north to Beattyville, about 75 miles. Rights-of-way were secured several years ago by the old Louisville & Atlantic, and are now controlled by the Louisville & Nashville. The proposed extension will traverse rich coal and timber sections in Knox, Clay, Jackson and Owsley counties.

MANILA RAILWAY.—This company, operating about 186 miles of road in the Philippine Islands, is reported to be building an additional 50 miles. H. L. Higgins, of Manila, is Chief Engineer.

MEXICAN ROADS.—Oscar J. Braniff has obtained a railroad concession from his hacienda in the State of Vera Cruz to the cities of Leon and Salamanca. Rafael Davila and Salvador Cardenas Peña, of Monterey, have obtained a concession to build a railroad between Allende and Zaragoza. A. H. McKay, who represents Canadian lumbermen, is applying for a concession to build a 30-mile railroad from the Blalock colony, State of Tamaulipas, to connect with the Mexican Central at Aguelles.

MICHIGAN CENTRAL.—At the final hearing of the special Federal commission to pass upon the plans of this company for tunneling the Detroit river, there was no opposition to the plans proposed, and they were adopted; and work is to be commenced about March 1.

NORTH CAROLINA ROADS.—Henry C. Bridgers, of Tarboro, N. C., writes us that he is in the market for spikes, switches, steam-shovels, angle bars, grading outfit, scrapers, etc., for building a proposed railroad from Farmville, N. C., for a distance of 15 miles into Green County.

PAN-AMERICAN.—A narrow-gage line is projected by this company between San Geronimo and Juan Felipe, State of Vera Cruz, 26 miles.

PENNSYLVANIA LINES WEST.—In connection with the double-track work on the Cleveland & Pittsburg from Steubenville to Bellaire, the company has bought 25 acres of land in the town of Burlington, Ohio, a mile north of Wheeling, W. Va., on the west side of the Ohio river. It is said that the town has about 250 houses, and that the company will remove all these buildings this summer and establish large yards on the site.

The work to be carried out by this company and its controlled lines, including the Vandalia, during the present year, includes double tracking at a cost of $1,200,000. Track elevation in Indianapolis at a cost of $270,000, and a new freight

house at the same place $380,000, for which bids are about ready to be asked.

Philippine Railroads.—The Philippine commission at Washington, D. C., has accepted the bids of J. G. White & Company, of New York, for building railroads in the Islands of Cebu, Panay and Negros. No contracts have been let for the other proposed roads, for which bids were recently opened. (See issue of January 26, p 25.)

Shreveport, Jonesboro & Natchez.—This company has been organized in Louisiana, with a capital of $1,500,000, and with offices at Jonesboro, in Jackson Parish, to build a railroad from Jonesboro southeast through the Parishes of Winn, Caldwell, Catahoula and Concordia, to Natchez, Miss.; also from Jonesboro north through Jackson, Bienville, Bossier, and Caddo Parishes, to Shreveport. Incorporators include: C. E. Neeley, of St. Louis; W. W. Brown and W. W. Ramsey, of Camden, Ark.; W. D. Hutchinson; J. S. Craigie, of Jonesboro, La.; R. N. Garrett, of Eldorado, Ark.; C. A. Henderson, of Arkadelphia, Ark.

Sierra & Eastern.—Incorporated at Bakersfield, Cal., with Los Angeles as the principal place of business, to build a railroad from Tehachapi, Cal., east to Searchlight, Lincoln County, Nev., a distance of 200 miles. The company is capitalized at $250,000. J. A. Chanslor and C. A. Canfield, of the Associated Oil Company, are interested. H. M. McIntosh, of Chicago, is a director.

Southern.—See Asheville Southern above.

Toluca & Zihuatanejo (Electric).—A concession from the Mexican Government has been asked for by Henkel Brothers, of Toluca, who own short lines from Mexico City to San Juan de los Huertas, and to Tenango, to build an electric railroad from San Juan to Temascaltepec, Tejuplico, and Cotzumala, thence along the valley of the Rio Balsas, to a point where it emerges from the Sierra Madre, thence along the coast to Zihuatenjo. Surveys have been completed and subsidies granted by the States of Mexico and Michoacan. This line when completed will furnish a route from the gold and silver mines of Sultepec and Temascaltepec, and the copper country of the Balsas.

Tonopah & Tidewater.—An officer writes that this company is building, with its own forces, its proposed road from Ludlow, Cal., to Bullfrog, Nev., a distance of 158 miles. Thirty miles have been graded, and track is laid for a distance of 13½ miles. The work is easy, the maximum grades being 2 per cent. with easy curves. F. M. Smith, of San Francisco, Cal., is President, and John Ryan, of Stagg, Cal., is Chief Engineer. (Jan. 12, p. 14.)

RAILROAD CORPORATION NEWS.

Atchison, Topeka & Santa Fe.—The gross earnings of this company for the six months ended December 31 were $38,500,793, an increase of $3,985,705, and the net earnings were $14,908,369, an increase of $2,338,006.

Central of Georgia.—The gross earnings of this company for the six months ended December 31 were $5,880,090, an increase of $396,029, and the net earnings were $1,850,644, an increase of $149,560.

Chicago Great Western.—A dividend of 2½ per cent. was, on Wednesday, declared on the $11,336,000 preferred "A" stock, covering the half year ended Dec. 31, 1905. No dividend had been paid on this stock since February, 1904; from 1900 to 1904, 5 per cent. was paid annually.

Chicago, Milwaukee & St. Paul.—The gross earnings for the half year ended December 31 were $29,046,884, an increase of $2,425,502. The increase in net earnings for the same period was $352,611.

Chicago, Rock Island & Pacific.—Speyer & Company, of New York, have bought $11,784,000 first and refunding mortgage 4 per cent. bonds of 1934 of this company. This is part of an authorized issue of $163,000,000, of which amount $82,025,000 is reserved to retire bonds of the company, and its auxiliary roads $38,500,000 for future acquisitions of property, $27,475,000 for betterments, and $15,000,000 issuable in 1904 for general corporate purposes. Of the amount just sold $3,500,000 is for additions and improvements, $6,500,000 for refunding Burlington, Cedar Rapids & Northern first mortgage 5 per cent. bonds, and the remainder for retiring C., R. I. & P. serial 4 per cent. bonds, Choctaw division bonds and equipment notes.

See Rock Island, Arkansas & Louisiana.

Interborough-Metropolitan.—According to an advertisement to the holders of stock of the Interborough Rapid Transit, the Metropolitan Street Railway and the Metropolitan Securities Company, the Interborough-Metropolitan, whose incorporation was announced in the *Railroad Gazette* last week, is to authorize $55,000,000 5 per cent. cumulative preferred, $100,000,000 common stock and $70,000,000 4½ per cent. collateral trust bonds of 1956. Dividends on the preferred stock will begin April 1, 1906, but this stock will have no voting power except in case of default in the payment of dividends thereon. The common stock will be deposited under a voting trust agreement, the following being the voting trustees: August Belmont, W. G. Oakman, T. F. Ryan, Cornelius Vanderbilt and P. A. B. Widener. The collateral trust bonds are to be secured by the pledge and deposit of all the capital stock of the Interborough Rapid Transit Company with the Windsor Trust Company as trustee, and are to be issued only against such deposit and pledge at the rate of $1,000 in bonds for each five shares of stock. The date by which deposit of the securities of the three old companies must be made in order to exchange them for new securities is given as March 1, 1906.

Lehigh Valley.—The Common Pleas Court of Pennsylvania has decided that this company must pay 100 per cent. in back dividends to the holders of the $106,300 of 10 per cent. cumulative preferred stock. Last August another court held that the company must pay 70 per cent., since no dividends had been paid for the 10 years ending July, 1904, 30 per cent. in extra dividends having been paid before that. The case was appealed and the court in the trial just closed held that since this 30 per cent. was in the shape of stock dividends, and was paid to common and preferred alike, such payment should not affect the claims of the preferred stockholders to the full 10 per cent. yearly.

Manila Electric.—William Salomon & Company, of New York, are offering at par a block of the first lien and collateral trust sinking fund 5 per cent. bonds of 1953 of this company, of which $4,635,000 are outstanding. The bonds are subject to redemption on any interest day on or after March 1, 1928, and to purchase for the sinking fund on or after March 1, 1908, at a price not to exceed 105 and interest. They are secured by a first lien on the entire property of the Manila Electric Railroad & Light Company through the deposit of $3,000,000 first mortgage 6 per cent. bonds on the entire capital stock of the company, as well as by the stock of other subsidiary companies in Manila. The Manila Electric controls the street railway, light and power business of Manila, P. I. It has in operation 40 miles of road and considerable additional mileage under construction.

New York, Chicago & St. Louis.—The gross earnings (partly estimated) for the year ended December 31, were $9,108,730, an increase of $463,355, and the net earnings increase $285,705. The surplus, after charges, was $294,926, as compared with $38,916 in the previous year.

Pacific Coast.—It is reported that E. H. Harriman has, by the transfer of $10,000,000 of stock, gained control of the Pacific Coast Co.

Pennsylvania.—In response to a Congressional resolution President Roosevelt has called on the Interstate Commerce Commission for a report regarding the alleged existence of a combination between the Pennsylvania, the Baltimore & Ohio, the Chesapeake & Ohio and other railroads in violation of the Anti-Trust law. According to the last annual report of the Pennsylvania, its stock holdings in the other companies in question, with their total stock issues in common and preferred and the percentage held by the Pennsylvania, are as follows: Baltimore & Ohio, total stock outstanding, $184,258,524; Pennsylvania holdings, $67,678,300, $36^{7}/_{10}$ per cent.; Chesapeake & Ohio, total stock outstanding, $62,790,400; Pennsylvania holdings, $15,630,000, $24^{9}/_{10}$ per cent.; Norfolk & Western, total stock outstanding, $87,457,000; Pennsylvania holdings, $38,830,000, $36^{6}/_{10}$ per cent.; Northern Central, total stock outstanding, $17,193,425; Pennsylvania holdings, $9,401,950, $54^{6}/_{10}$ per cent. The Northern Central is not a competitor of the Pennsylvania proper.

Reading.—The gross earnings of the Philadelphia & Reading Company for the year ended December 31 were $20,822,904, an increase of $2,651,653, and the net earnings were $8,884,024, an increase of $203,636. The net earnings of the Railway Company, the Coal & Iron Company, and the Reading Company were $10,813,249, and the surplus after charges was $5,602,249, an increase of $331,958.

Rock Island, Arkansas & Louisiana.—The stockholders of this company have ratified the lease of all its property to the Chicago, Rock Island & Pacific. (November 24, p. 166.)

Youngstown & Ravenna.—The stockholders have authorized an increase in the capital stock from $10,000 to $1,000,000. This road is the Ravenna cut-off, 26 miles long, which was built jointly by the Baltimore & Ohio and the Pennsylvania, and is used by both for a more direct route between Cleveland & Pittsburg.